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AVIATION WEEK

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AVIATION CALENDAR

Jan. 13-15—19th Annual National Conv.
of Underwriters Association of America,
Woolsey Hills Inn, Del Norte, Wash.

Jan. 14-16/17—19th Annual Meeting, Society
of Automotive Engineers, Sherman Shores
Astro Hotel, Los Angeles, Calif.

Jan. 15-16—14th Latin American Space
Technology, sponsored by University of
California and Space Workshops Corp.,
to be held in Los Angeles, San Diego and
San Francisco. For details write: Director
of California Programs, Dept. of
Conservation, 2800 Spring Avenue, Los
Angeles, Calif.

Jan. 14-15—Annual Insurance Fairs & Seminars,
sponsored by Associated Insurers
Society of America (Insureds' Council), Wilton
and Portland County, Sherman Shores
Astro Hotel, Los Angeles, Calif.

Jan. 16-Meeting of Technical Committee
on Safety of Plastic Engineers Inst.
of Chemicals Hotel, Detroit, Mich.

Jan. 20—Winter Meeting, Professional
Western States Society, The Conference
Institute, California Institute of
Technology, Pasadena Calif. For details
write: V. G. Cole, Box 100, Mariposa
St., San Luis Obispo, Calif.

Jan. 20—Information Theory and the
Communication Engineers' Seminar By Dr. M.
Sklar, Consultant, Physical Science
Auditorium, University of Pennsylvania,
Philadelphia, Pa.

Jan. 20-21-22—Annual General Meeting,
Association of Land and Treasury Agents,
Washington Hotel, Washington,
D. C.

Jan. 20-Feb. 7—American Institute for Con-
tinuing Education and Business Policy, Four
Seasons Hotel, New York City.

Jan. 22-25—1st International Oil Show &
Exposition Under Hall, Shreveport, La. For
details write: P.O. Box 2579, Shreveport, La.

Jan. 27-29/28—19th Annual Meeting, Society
of the American Surveyors, Sherman
Astro Hotel, N.Y.C. House Night Club.

(Continued on page 8)

ADDITIONAL WORKS IN MINUTE 12, 1911

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U.S. Patent Office grants a preliminary patent to the U.S. Patent Office.

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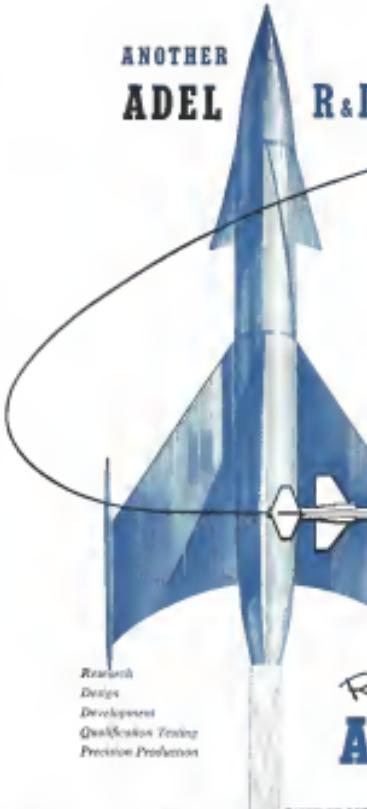
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TABLE II
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ISSN 1062-1024 • VOLUME 32 NUMBER 10 • NOVEMBER 1999 • 100 PAGES • \$10.00 PER COPY

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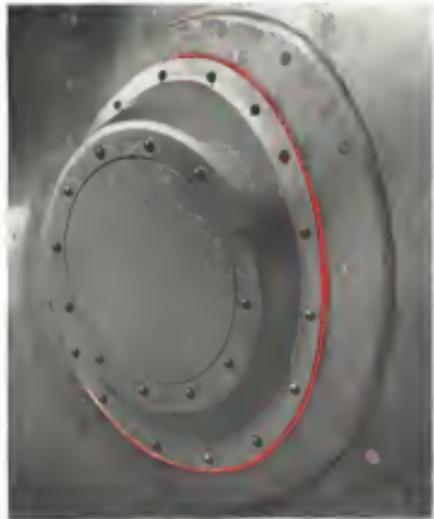
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Radar dishes being lowered at test at Fort Huachuca. Ironically concealed by van equipment, it serves as a flying camera to spot enemy movements and evasions.

U. S. ARMY SIGNAL CORPS DEVELOPS ELECTRONICS FOR ATOMIC-AGE AT FORT HUACHUCA PROVING GROUND

Fort Huachuca, once a sleepy cavalry post, has come of age in the last few years. When the United States Army Electronic Proving Ground was established here in early 1954, this mile-high post was set upon a new test facility used by electronic tubes, transistors, radar antennas, and television cameras.

Nestled against the base of the rugged Huachuca mountains about 300 miles north of Tucson, in 75,000 plus acres are a beehive of electronic activity under United States Army Signal Corps direction. The many types of different terminals are used for the testing of electronic equipment.

Nearly 5,000 military personnel and approximately 2,000 civilian employees, most of whom highly skilled technicians, are engaged in work at the Proving Ground.

The new test station is placing heavy burdens on the United States Army Signal Corps. One of course, is to make communications with the test areas available for research and development. The Combat Development Department at the Proving Ground has been experiencing along these lines. A new test system of battlefield communications designed to meet the threat of war detection from nuclear attack is now in the planning stages.

Meanwhile, the Signal Communications Department is conducting tests on both standard and exper-

imental United States Army Signal Corps equipment to determine their value with the new look in defense. Under atomic attack, the use of microwave when will not be practical. Microwave communications is the answer, but ways to put these channels on radio frequency would be found.

With the spread-out of troops under atomic attack, increased surveillance of combat areas is necessary. The Combat Surveillance Department of USAEC is presently developing and testing a surveillance system with devices on the ground and in the air to bring reconnaissance and fire control information to the field commander.

Another important Proving Ground product is the "Phantom Camera." A high speed camera is mounted on the front of a missile and fired during development. The missile is launched and goes up to a range of 100 miles. When its mission is completed, the device parachutes to the ground near the original launching site. The up-to-the-moment pictures are developed, and the troops prepared to hit the pre-programmed area of resistance.

There are not a few of the many projects under way at Fort Huachuca, helping to keep our country's military offense and defense the world's best.



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This is one of 1,000 sets of jobs on the technical activities of the Department of Defense.

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January 13, 1958

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The photograph (left) shows the inside of a "Marconi" section, with the receiver rack to the center. Fixating the face panels on this rack posed a problem for Belden Radio Division, manufacturer of the equipment. Because the frame is made of square tubing slotted for greater strength, ordinary nuts and bolts could not do the job.

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EDITORIAL

Aviation's 1958 Scoreboard

Congress last week opened its most significant session since World War II. It is now crystal clear to almost every citizen and legislator that the United States faces the most severe challenge to its existence since the birth of the republic. It is pretty generally recognized that maintaining the political, economic and military strength required for robust survival in face of the Soviet challenge demands new thinking, vigorous action and courageous confidence in the human and natural resources of this nation.

After several years of complacent hope that the specter of Soviet expansion would vanish like a nightmare at dawn, even the political leaders of the present Administration are reluctantly beginning to admit that we face a formidable adversary. Whether this belief by the Administration has grown strong enough to provide the decisive leadership the situation requires will be one of the major issues debated in the coming Congress and by the American people whose future is at stake. In this session of Congress, aviation will be one of the dominant issues. The whole defense posture hangs on the scope and pace at which aeronautical technology, with its allied fields of avionics, propulsions and materials, will be permitted to operate by political and fiscal actions of the Congress and the executive branch of the government.

In this area some of the crucial points to watch for in keeping score are:

- What will happen to the research and development budget? Will it go along at about the same level of the past three years with perhaps a token increase that will be eaten quickly by the rising cost of living? Or will it get the ample increase that is reported, perhaps doubling or tripling present levels? And will it get the wholehearted support of the Pentagon and White House or part a hypocrite enforcement that will do little to accelerate or expand this critical activity?

- What will happen to the major advanced weapons projects such as the Wizard missile defense system, the hypersonic glide bomber, and various space vehicles? Will they be pushed boldly, backed by technical and financial resources commensurate with the tasks involved or will they suffer from further delays, grow mired in advisory committee meetings and be budgeted and allotted to death?

- What will happen to the ballistic missile programs that are often promise of a relatively quick payoff in new

operational weapons? Will it be pushed to the full limit of our industrial and military capacity to build those weapons and put them into service? Or will these programs be continued "on schedule" to fit a pre-Sputnik schedule that had no element of urgency in its drafting?

- What will happen to the major production contracts and schedules for conventional weapons needed so badly to strengthen the current strength of our forces in being? Will those Whiteman cutbacks stand so that these weapons will not be fully operational in the inventory until 1960 when a new generation should really be taking their place? Or will they be speeded up to modernize Strategic Air Command, Air Defense Command and the Navy's carrier based striking power and antiaircraft strength as soon as is technically possible?

- What will happen to the air logistics system as vital for Army, Navy and Air Force to function in the era of shorter warfar when other logistic pipelines are too slow and too vulnerable? Will we continue to develop and produce weapons without any modern logistic support for them combat operations? Or will we develop a modern gas turbine powered air logistics system that can meet the requirements of future military operations?

These are some of the issues to watch to see what happens to aviation and the future of that country in this year of decisions.

—Robert Hays

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WHO'S WHERE

In the Front Office

Arie Runk, president, Aeroflex Systems, Air India Systems, Inc.; Mr. Runk succeeds Robert H. Holt, now chairman.

George P. Chapman, president and director of military requirements, Fairchild Engine & Airplane Corp., Farmington Hills, Mich. E. F. Nachod, Jr., succeeds Mr. Chapman as vice president and general manager of Fairchild Engine Division. Don P. Nease

Perry L. Spangler, vice president, Raytheon Manufacturing Co., Waltham, Mass.

William H. Bush, Jr., executive vice president, and William E. Pohleman, managing director, Aeroflex International, Mountain View, Calif. Division, Mich.

Richard A. Miles, vice president engineering, Bellcore Laboratories, Inc., Los Angeles, Calif.

C. George Heriotson, vice president sales, John A. Roebling's Sons Corp., Penns. N. J.

Mike Lee, Frank E. Shantz (USA), exec. assistant to the president, Viasat Assoc. Inc., Palo Alto, Calif.

Honors and Elections

Whitier G. Collins, president of Northrop Aircraft Div., has been elected president of the Los Angeles Post of the United States Chamber of Commerce.

The Society of Automotive Engineers, Inc., has announced the following two persons as recipients of the highest awards for 1970: E. M. Chisholm, president of Right Axle, Detroit, Mich., for lifetime achievement; and H. W. Helgesen, assistant manager, Taklamakan, Searles, Ca., division of Convair Corp.-aerospace C. E. M. M. M. chief, engineering services, Viasat Division, Convair/Motor Corp., research project.

Changes

Turk Clark, military systems engineer, Standardized Components Division, Delco Electronics, Inc., Indianapolis, Ind.

Lowell S. Follett, administrator and development supervisor, Remfert Corp., El Segundo, Calif.

Edward S. Bostick, manager of operations, Vought Orbital Data, Vought Electronik Corp., Dallas, Tex.; Mr. Heribert L. Schmitz, Midwest regional sales manager, Government Electronics Division, Emerson Radio & Phonograph Corp., Dallas, Texas, Md.

John M. Rowan, senior test manager, Aero-Harmonics, Inc., Webster, N.Y., Victor, Inc., Denver, Mich.

A. E. Tihminci, west coast representative, Los Angeles County and Defense Products Division, French & Lamb Optical Co., Somers, N.Y.

Mr. Gary E. P. Morling (USAF, ret.) will join the American Ordnance Association, Washington, D.C.

A. J. Tolman, Jr., director of engineering, Electro-Optic Corp., hostile takeover, N.Y.

INDUSTRY OBSERVER

► Watch for USAF to announce a major production contract for the Convair B-52 in-service jet booster. Decision to put B-52 into production beyond test quantity of 30 now on order has been made by USAF's Air Council with strong support from Strategic Air Command.

► Bell Aerospace and North America's Rockwell Division are static firing small scale Exocet rocket motor. In evaluation with antennas at atmospheric classified facility, the liquid thrust motor offers a specific impulse above 300, or better than a 25% increase in performance over present propellant combustion. Full scale production should at least engine rate 100 lbf in five years away. Lack of gauge may be for liquid fluorine service as one of the major drawbacks. The large amount of money needed for further development is another.

► Aerophysics Development Corp., Santa Barbara, Calif., a subsidiary of Curtiss-Wright Corp., is proposing to the Defense Department several ballistic missiles and test systems using today's off-the-shelf hardware. Some version would have the capability of lifting the crew with payloads of 2,000 lb or better.

► Present planning calls for first flight of North America X-15 high-altitude research aircraft in January, 1979. First flight will be glide test only, with rocket flights scheduled to begin later next year. Projected Research Division of National Advisory Committee for Aeronautics already has made several proposals to the Department of Defense for scaling the X-15 into orbital aircraft vehicle.

► Air Force has approved delivery of Loening T33 turbine powerplant to Bell for installation into the YB-10 helicopter to make the aircraft although the engine has not yet passed its initial 250 hr. qualification test.

► Air Force is approaching helicopter manufacturers on the feasibility of using living insects for tactical movement of interdictive cargo. Helicopters, thin crews and supplies. Disinfectable mosquito would be transported in pods.

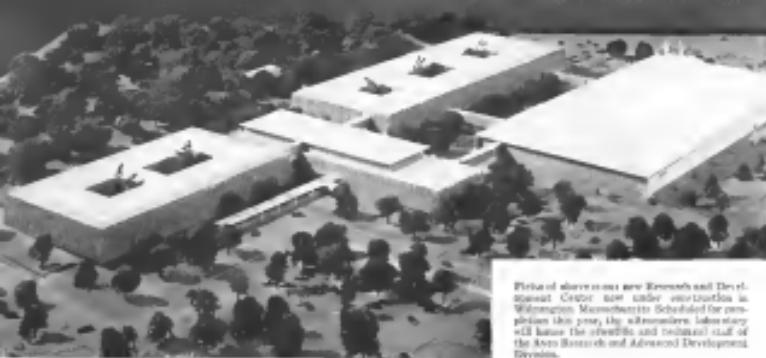
► East German plane working on the so-called-designed Rudo/Rosin turboprop transport (AVN No. 4, p. 4) is also reportedly developing a medium-range turboprop transport to be designated the B-10-15. First model of the B-10-15, to be built in batch 40 and 70 seat configuration, is anticipated for completion in May.

► Lockheed F-104 has successfully passed spin tests required by the company for USAF. Aircraft, equipped with spin chute was stalled 35 times at altitude of between 16,000 and 30,000 ft and landed in spin. F-104 also failed to spin when pilot had to execute the maneuver while coming out of a turn and during return entries and an accelerated entry. In a total of 50 tries, the aircraft was spun eight times by coupling deliberate stalls with a combination of nose control. Pilot recovered from these without use of the spin chute.

► Although both Atlas and Titan intercontinental ballistic missiles use three engines, Atlas is described as a round-trip stage missile and Titan as a two-stage. All three Atlas engines are fed at the ground. Two boosters drop off in flight. Titan's two boosters are ignited on the ground, drop off after solidbooster engine is ignited in flight.

► Radio Corp. of America has received a sizable Air Force contract for the development of an environmental bulleting missile early warning network, primarily employing radar.

► Convair is investigating the use of newer titanium alloys for use in future aircraft and missiles under an Air Force study contract. Convair is being specifically asked to determine the adaptability of the new alloys to the design, fabrication and construction of future weapons systems. Contract total is \$61,360,000.



Plans of Avco's new Research and Development Center now under construction in Waltham, Massachusetts. Scheduled for completion this year, the laboratory laboratory will house the research and development work of the Avco Research and Advanced Development Division.

Science and Progress at Avco—1957

Truly significant discoveries and technical progress are the goals of the Avco Research and Advanced Development Division. Some of the Avco RAD record of accomplishments are contained in professional papers in scientific and technical journals. Much of it is classified for reasons of military security. But the following public announcements serve to outline some of the steps taken by RAD—the "Breakthrough" Division of Avco—in pursuing its goal for 1957:

February 11, 1957 Site Prepared for Avco RAD Center

Avco to Make Hypersonic Shock Tube for Industry, Universities, Other Research Groups

July 1, 1957 Avco to Develop New Radio Pack Set for Marine Corps

July 2, 1957 Prime \$111 Million Contract Awarded for Development by Avco of Nose Cone for Intercontinental Ballistic Missile

August 26, 1957 Avco Shock Tube Research Has Profound Theoretical Breakthrough on 1000-Mile Air Force Ballistic Missiles

November 23, 1957 Tiny "Building Block" Revolutionizes Computer Design and Construction

December 9, 1957 Avco to Build Air Force Computer

Avco's need during the past year is significant from scientific, technical and business points of view. It has been made possible by untiring effort at RAD to maintain an atmosphere conducive to creative thinking and production of the highest order.

AVCO
Research & Advanced Development

Avco's new research division now offers unusual and exciting career opportunities for exceptionally able, young and forward-thinking scientists and engineers.

Write to Dr. E. W. Johnson, Scientific and Technical Relations, Avco Research and Advanced Development Division, 200 South Union Street, Lawrence, Massachusetts.

Washington Roundup

More Power for Halderman

Centralization of responsibility at Wilton M. Halderman, Pentagon director of guided missiles in combining work the boards of nuclear missiles and certain programs to be handled by the office of the Assistant Secretary of Defense for Research and Engineering. Under the new arrangement Halderman will have full charge of activity:

- Air Defense Missiles, headed by D. W. Petersen, former director of guided missiles at the office of the Assistant Secretary.
- Tactical missiles, headed by E. P. Swanner.
- Strategic missiles, headed by John W. Klots.
- Projects, headed by R. J. Coffey.

Reorganization probably will be announced on Capitol Hill, where congressional critics have been demanding more evidence that Halderman has executive power and will use it.

East-West Exchange?

Watch for public announcement of specific acquisition talks between the U.S. and Russia on the possibility of establishing a central exchange of information on space programs. Exchange would include such fields as metalurgy, chemistry and physics. The talks will begin in late October after an exchange of notes during the year, U.S. negotiator is State Department Ambassador William Ladd. Russia is represented by Ambassador Georgi N. Zorin.

Science Attaches Revived

State Department, prodded by Congress and Russia, is hard at work to re-establish its science attaché program designed to provide professional liaison posts in other countries where scientific developments may be worth sharing. There is \$200,000 in the current budget for the work and a few "interested" candidates are being urged to take a top job as science advisor. Once the advice is issued, special surveys will be sent to France, West Germany, Sweden, Japan and India.

Scientific Education

Democratic leadership in Congress wants to go further than the Administration on cutbacks to scientific education.

Legislation planned by Sen. Leverett H. Saltonstall, chairman of the Senate Labor and Public Welfare Committee, and Rep. Carl Elliott (D-Ala.), chairman of a House Education and Labor Subcommittee, would provide 10,000 college scholarships over a six-year period, \$10,000 a year. Of these, 75% would be for study at universities requiring minimum foreign language. The Administration plans to eliminate 10,000 scholarships a year for four years, a total \$40,000 (AWW Jan. 6, p. 37). In addition, the Hill-Elliott proposal would provide \$35 million for matching grants to states for construction of science training facilities.

Congressional Investigations

Two major congressional investigations get under way this week:

- House Armed Services Committee headed by Rep. Carl Vinson (D-Ga.) begins its investigation of the defense program and the organization of the defense establish-

ment bids. Vinson, like his counterpart, Sen. Richard Russell (D-Ga.), chairman of the Senate Armed Services Committee, is opposed to proposal to replace the Joint Chiefs of Staff with a single chief.

• House Government Operations Committee headed by Rep. Wayne L. Burdick (D-MI) begins an inquiry into federal research and development on Jan. 17 (AWW Dec. 2, p. 25). First witness will be Dr. DeLois Boddie, president of the National Academy of Sciences, and Alan T. Waterman, director of the National Science Foundation.

All Chiefs, No Indians

Rep. Charles B. Brownson (R-Ill.) last week submitted a proposal designed to prevent the exodus from service of such men as acting Lt. Gen. James Gandy, Army deputy chief of staff for research and development (see page 31). Brownson's plan A "crash program" to make every serviceman a two-star general. Under this plan Brownson said, "no enlisted man will ever again be compelled to take his uniform and go home because of a shortage of stars."

Navy the Richest

Richest branch of the Armed Forces in terms of cost per man, the Navy, with \$56.6 billion worth of goods purchased around the world. USAF is second with \$51.9 billion and Army, poorest with \$58.3 billion. Defense Department total at the end of the last fiscal year was up 30% over previous year's cost of real estate, equipment and other holdings. Most of the increase is attributed to jet aircraft modernization of the fleet and initial inclusion of Avco's stocks in Koen-

Engine Profits

Rep. Edward Hebert (D-Ala.), chairman of the House Armed Services Investigating Subcommittee, was on en route to Japan to investigate the profits and procurement practices of Japanese aircraft manufacturers this summer, but the subcommittee is likely the investigation will be quietly dropped. The subcommittee reported 17 manufacturers to submit extensive data last summer.

The charge against Curtis Wright Corp. that the firm owes \$1 million for cost on the use of government facilities used in commercial production was developed by General Accounting Office (AWW Dec. 16, p. 37). Last week the subcommittee postponed a public hearing on the case. It is being considered by the Armed Services Board of Contract Appeals.

Joint Symposium for Senators

Members of the Senate Intelligence and Foreign Committee, Chairman Arlen Specter, here heard by Senate A-3 Miss Monroe, who gives a comprehensive view of the planning, location, first flight into the commercial airline's transition from piston engines to jet aircraft. The symposium was presented by Air Transport Asia, Trans World Airlines, Pan American World Airways, Eastern Air Lines, United Air Lines and American Airlines. See Monroe and the information would be made into a Senate document to aid in future airport planning.

—Washington staff

Air Force R&D Faces Extensive Review

Reorientation, shift in emphasis in USAF projects are expected to result from Stever committee study.

By David Clark

Washington—Most current review of USAF's research and development activities since the Air Research and Development Command was created in 1951 is now being conducted by an ad hoc committee appointed by Gen Thomas D. White, Chief of Staff.

Expected result is a reorientation of all USAF research efforts to help the civilians still further from the current generation of weapon systems, including weapons to missiles and spacecraft.

Recommendations also are likely to reflect changing needs of the aircraft fleet, of sensors which have been reached continually but have not had a major overhaul in approximately a decade.

The committee, it has a history as the Ad Hoc Research and Development Committee, informally it is called, the Stever committee, and is headed by Dr Clifford Stever, associate dean of engineering at Massachusetts Institute of Technology, and former Air Force Chief Scientist. Dr. Stever also is vice chairman of USAF's Scientific Advisory Board and chairman of other ad hoc AFB committees.

Named Chairman

National Aeronautics Committee on Aerospace also has named Dr. Steven Chvostek of its new Special Committee on Space Technology as vice, page 29.

The Stever committee is being compared to the earlier group appointed in 1949 and headed by Dr. James K. Flanagan who was nominated in the creation of the Air Materiel Office of Deputy Chief of Staff for Development and of the Air Research and Development Command.

Stever's group is evaluating all aspects of USAF's research work, including reorganization of the Deputy Chief's office, ARDC, the research committee's relationships with Air Materiel Command and current and future requirements of operating agencies such as Air Defense and Strategic Air Command.

Recommendations may be ready by early spring. Other members are:

Brian Amdahl, president of the System-Ware Corp.

Dr. W. R. Lovell II, Lawrence Foundation for Medical Educational Research.

Dr. Clifford T. Morgan, private consultant in psychology.

Prof. Conrad D. Pekris, Depart-

ment of Aeronautical Engineering at Princeton University and former USAF Civil Service.

• Foss W. Pratt, assistant engineering manager, Pratt & Whitney Aircraft Division United Aircraft Corp.

• Dean Ralph A. Stevens, University of Michigan School of Graduate Studies.

• Dr. T. F. Wallace, Executive & Rockford Associates.

Evaluation Scope

Committee was created last November at the recommendation of its chairman, Gen. John W. Stever, to evaluate all USAF research activities and to make recommendations to the Air Force Chief of Staff. It will be continuing its evaluation of the Air Force's research functions, policies and procedures in two areas: research and development and basic science administration, which could lead to increased effectiveness.

Committee began work last Nov. 21 and already has visited a number of

offices and various ARDC centers. Stever groups thus apparently is not limited with respect to an entire reexamination of ARDC. In fact, the Nov. 29th, p. 261 which is the second of 24 possible discussions looks to improve effectiveness and to meet stringent performance ceilings than is called.

In addition to the Stever committee's task, ARDC itself has been going considerably, with its recent rounds to its organizational structure and its role in the overall defense program.

ARDC then for less made no change in its name or in its organizational structure. But it clearly has been considering shift to broad-based emphasis and the rapidly changing political climate of the past few months. The Directorate of Applications under the Deputy Chief of Staff for Research and Development has been known until last Dec. 16 as the Directorate of Applications and the Directorate of Academic Programs. This has become the High Mechanics Division.



HONEY must be grounded to turn off sunning light will be checked on before it is sent into space.

Cornell Probes Weightlessness

Studies of how to investigate the effects of man's vertebral functions as opposed to physiological reactions during weightless space travel in satellites or other space vehicles have been undertaken at Cornell University's Space and Aerobic Research and Laboratory, Inc., for Air Research and Development Command.

Recommendations may be ready by early spring. Other members are:

• Brian Amdahl, president of the System-Ware Corp.

• Dr. W. R. Lovell II, Lawrence Foundation for Medical Educational Research.

• Dr. Clifford T. Morgan, private consultant in psychology.

• Prof. Conrad D. Pekris, Depart-

AVIATION WEEK January 12, 1968

Stapp to WADC

Washington—Col. John P. Stapp, Chief of the Air Force Medical Development Center, Brooks Air Force Base, Texas, will come to Headquarters Wright Air Development Center, Dayton, Ohio, to head the Air Medical Laboratories there.

Col. Stapp is a pioneer in human and animal medical research. His career at Brooks dates back to the time when the field laboratory at Brooks was known as the Space Biology Field Lab center. He will replace Col. Jack Bellhead at WADC.

center of a space capsule and under the weightlessness inherent in orbital experimentation.

Laboratory techniques involved are not experiments which could be expected to detect disturbance in cognition, orientation and concentration during exposure to weightlessness.

The monkey used will be exposed to the experiments for only a few minutes and then returned safely to Earth as participant.

Part of the experiment is to train both animals to respond to certain commands on the ground, then subject them to the same (or similar) state of weightlessness and see if their response was in any way affected by weightlessness.

Monkey Is More Complex

Dr. monkeys' experiments would be more complex than the rats'. It would be strapped into the capsule with its arms attached to levers which it can move either to the right or to the left. Limited degrees of arm lever in front of the monkey will be two light-red and green—which will be turned up or down to provide a cue for the monkey to hold its arm straight or to the position.

The monkey, in order to orient his balance, will be turned on the ground to induce a manner known as "double-inversion disorientation." This will teach him that he could read the disturbances of the light by moving the right lever to the right and the left lever to the left. This is a negative drive.

The rat will be subjected to "self stimulation" in order to stimulate his own decision behavior. Example is to have the rat separated, perform a specific response which is followed by a pleasant stimulus. This is a positive drive.

Positive and Negative

Cornell recommended use of self stimulation technique for the rat and the moderate procedure for the monkey to provide an reduction of the effectiveness of the capsule.

Photo Shows Details of Atlas



AVIATION WEEK January 12, 1968

case of both positive and negative dives during weightlessness. The difference between the two animals thereafter also may prove of help in separating results. Both animals would occupy the same capsule.

Wernher von Braun's design the animals can return their known capacities to respond to known stimulation during a weightless state is the present question.

Behavior of both animals will be recorded by motion picture cameras as well as by television equipment.

Work on this project is being done by the Human Factors Section of the Lehman's Vehicle Division Department in collaboration with Professor B. Richard Bigelow, Psychology Department, University of Buffalo.

Hobbs Will Retire From United Aircraft

East Hartford, Conn.—Leroy S. Hobbs will retire April 7 from his position as vice chairman of United Aircraft Corp. after 30 years of service with the company and its predecessors. He will continue on the board of directors and on the executive committee.

Hobbs, whose retirement was announced at the conclusion of last week's board meeting, was awarded the Collier Trophy in 1951 for development of the J57 turbojet engine. He also was instrumental in the development of Pratt & Whitney's line of piston engines, including the R-2800 Double

Wasps and the R-4360 Wasp Major. He first joined the original Pratt & Whitney Aircraft Company in 1937 as a research engineer. He was elected vice chairman of United in 1956 and has been a director of the corporation since 1947.

Beech MS-760 Price Quoted at \$210,000

Wichita-Beech Aircraft Corp. will market the French MS-760 executive jet transport for a package price of \$210,000, considerably less than the \$300,000 tentatively quoted when Beech was demonstrating the MS-760 here in 1974.

Package price is for a complete standard airplane including paint and upholstery. It also includes a small number of spares, ground handling equipment, special tools and a basic finance training course for one or two clients.

Under an existing sales program Beech will stock spare engines and parts in Wichita (AW Dec. 9, 1975, p. 114) and the company said it can deliver them anywhere in the U.S. or Canada in one day. Replacement engines will be available here to save time during overhauls. Complete engine change can be done in less than an hour, Beech says.

Beech is selling the MS-760 under license from Morane-Saulnier Co. The four-place twin-engine jet will be shipped from France and assembled in

More Polaris Money

Washington—Apparently \$47 million more in fiscal 1976 funds will be put into the Navy's Polaris fleet bid later missile system. Lockheed Aircraft Corp. and last week.

Lockheed's Missile Systems Division is currently managing the development of Polaris. The new funds will help the field Navy transition to Polaris to 630 missiles. Navy considers the L390 six missile as top priority weapon system and is accelerating it again, partly as a result of recent Senate Appropriations hearings concerning submarine losses.

Lockheed's original contract was for \$221.5 million. Last October Navy announced a \$83.3 million fiscal 1975 contract for milestones.

New York. First airplane will be delivered in January 1978 and will be a demonstrator. Second unit, scheduled for July delivery, has been sold to Twa-Aero Roller Bearing Co. (AW Dec. 2, 1977, p. 9).

Beech will sell the MS-760 with U.S.-built instruments, and the airplane's cabin will be pressurized. Service rating is being set at 19,000 ft under Civil Aeromedical Regulations Part 3.

Pratt & Whitney is powered by two Turbomeca Marboré 2C engines, each rated at 383 lb thrust. Gross weight is 7,775 lb. MS-760 will cruise at 390 mph, has a top speed of 403 mph and a range of about 1,000 miles.



Egyptians Display Soviet-Built Aircraft

Egyptian Air Force aircraft public display at Abuqir Airfield included (left) two MiG-21s (Sopwiths), (middle) an all-weather equipped MiG-19, MiG-21, MiG-23 tactical bombers, Yak-31 advanced trainer and two Czech Zlin Z-526 T-51 training photo jet (seen right) as apparently part of an B-11 transport. Assembly was also marked by MiG fighters in major roles.



McAfee of Army Jupiter intermediate range ballistic missile recently was exhibited at Chicago Auto Show in Chicago International Amphitheater. Missiles will not be dimensionally altered to fit missile dimensions were reported to be 602 ft long, seven feet in diameter. Exhaust cone is about four feet in diameter. Note Jupiter ground handling arms and trailer.

Chrysler Gets Order For Jupiter Parts

Washington—Chrysler Corp., Warren, Mich., has been awarded a \$10 million contract for components and ground-support equipment for the Jupiter intermediate range ballistic missile.

The Army developed weapon will be operated by the Air Force, along with its own Douglas-Desert IRBM. The Defense Department made the money available for the Jupiter procurement program during the continuing fiscal of fiscal 1983.

Another \$21.5 million in contracts was awarded to Chrysler for continued production of the Army Redstone missile also produced at the Warren facility.

Brig. Gen. John A. Barlow, commanding general of the Army Ballistic Missile Agency, Huntsville, Ala., recently said the deployment date for Jupiter was the fall of 1983. He defined deployment as having Jupiter in Europe, complete with support equipment and troops trained to use the missile.

The cost of Jupiter on a production basis would be the neighborhood of \$1 million each without overhead, Barlow said.

NACA Space Group

Washington—Established as a separate organization on space technology headed by Dr. H. C. Givord, former director of the Air Force's research and development work by the National Air Space Commission for Aerospace.

The space commission, which will keep flight and space NACA will be responsible for flight and space activities.

In Jan. 1978, Dr. NACA's NACA division and its headquarters should be completed within the month. Dr. Donald C. Stull, current director, will be a leader in some aspect of the lead field.

Dr. Steven, new associate director of engineering at Massachusetts Institute of Technology, agreed to head DRAF soonest in 1978-79. He also is chairman of the Scientific Advisory Board of the Chief of Staff, USAF.

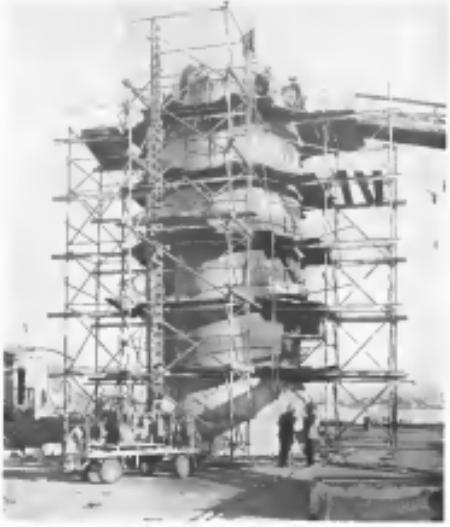
Missile Divisions Begin Organization

Englewood, Calif.—Strategic Air Command's missile division, Castle AFB, Calif., will kill long reportable for achieving operational establishment of intercontinental ballistic missile squadrons and training of intercontinental range ballistic missile units for nuclear operations, has been placed under the command of Maj. Gen. David W. Yost.

Part of ICBM squadrons—the 67th—had already been based and headquartered at Castle AFB under the command of Col. Harry J. Zwick, former SAC project officer for Three At Air Research and Development Command's Reliant Missile Division. Personnel at Castle have numbered about 1,000, but these are now being leveraged through

Part of Jupiter IRBM squadrons—the 86th—scheduled for activation on Jan. 15 and will be commanded by USAF Col. William C. Edwards, former assistant to the deputy commander for plans and operations at the Ballistic Missile Division. Initially, Air Force personnel for Jupiter squadrons will train at Army's Redstone Arsenal in Huntsville, Ala. No address or Jupiter for yet has been received here.

Training at Castle AFB overall,



Polaris Launching Pod

Launching vehicle or pod under construction for Polaris test work probably is similar to equipment the Navy will use in its intermediate range ballistic missile from under the water. After an release from a submarine, the pod's bullet units would coast in depth and keep it flying right at the water. Equipment in the pod would be similarly mounted from a潜射拦截器 located near dinner over. Suggestions also have been made that the Polaris pods remain until they could be used this means to fire her later. The interceptors would then have the velocity and range to intercept any aircraft against the launching area. Flying later tests by Weymouth Haven, Calif., will be housed in a 30 ft long cylinder. Major Island Naval Shipyard, Vinton, Calif., designer and builder of vehicle, expects to complete it by end of this month.

will include flying of ballistic missiles including the ICBM. Col. Thomas S. Post, SAC commander, would not estimate the number of ICBMs to be allocated to each operational squadron.

Gen. Power said no plan has yet been made to introduce the North Star intercontinental ballistic missile onto the Cooke AFB roster and would not when Star would become an operational missile.

Gen. Power emphasized that improved aircraft had a defense place in SAC's future, commenting that missiles and bombers will supplement each other.

He said there were no plans now to assemble intermediate range ballistic missiles in Western Europe and stop

research there for fitting in the cascade.

Missiles fired at Cooke would cover a

a Pacific Ocean range. Gen. Ronald A. Salter, Ballistic Missile Division Commander, and his staff would not be a research and development unit, but only for testing firing. It will be held in depth with Nav's Pt. Mugu station for developing intercontinental missiles. Plans are to extend Mugu range to accommodate flights for out into the Pacific beyond the distance of Hawaii.

An 8,000 ft runway will be built at Cooke for Ingalls' support of the base, Col. Salter said. Of the 30,000 acres at Cooke, 60,000 will be for Air Force. Defense may be used by Navy for extension of Pt. Mugu activities

Pratt & Whitney Gives Schmeckrath New Post

Bob Hufferd, Com-Bernard A. Schmeckrath has been named assistant engineering manager of the Pratt & Whitney Division of United Aircraft Corp. from his former position as general manager of the division's nuclear engine department at East Hartford.

The nuclear engine program at the Government Aircraft Nuclear Engine Laboratory in Middletown will be integrated into the division's overall engineering program rather than continuing as a separate operation.

Schmeckrath will retain prime responsibility for the program, and Gen. E. Haltziger, chief engineer at Middletown, will remain as resident head of the program.

The program will continue at the present lead under Atomic Energy Commission sponsorship. Air Force participation in share of the support services costs goes to the cost of defense responsibility contract (AW Aug. 18, 1967, p. 54).

Three Marks Claimed For Army Helicopter

Washington—Three new world altitude records for helicopters are being claimed in Army for the Sikorsky VH-41 Sioux powered by a 278 hp Continental P500C piston engine.

The first record, helicopter, flown by Capt. John E. Bowes of the Army Aviation Research Branch, Ft. Rucker, Ala. to 18,155 ft. in two-weight configuration, 1,103 lb. to 2,304 lb. was registered in a new weight category, 2,284 lb. 7,918 lb. the helicopter reached 18,208 ft.

All three records are set for maximum altitude by the Federation Aeronautique Internationale.

Previous altitude records in this registered weight and LH-602 to 2,596 lb. class was 18,351 ft. established by Jean Boulet of France in an S-5 E Alouette III. June 6, 1958.

Symposium Concludes Reliability Goal Closer

Washington—U. S. goal of obtaining reliable military electronic equipment is closer—but not much closer—than before, according to speakers at the Fourth National Symposium on Reliability and Quality Control here. Problems being discussed range from production of components capable of operating for 10,000 to 100,000 hours under extreme environmental conditions to techniques for keeping quality competitive, such as the SMC's re-

turn to AN/FSQ-7, operating for some than a few hours.

One conclusion of military studies is that in the future, a manufacturer's past performance in maintaining high standards of reliability, must receive increasing attention.

Another is that generators should be developed for dispersing maintenance with poor records of performance, low cost, and low reliability.

Results of an Air Force study to determine reliability of strategic equipment now in use was presented by Lt. Col. J. S. Lambart of Air Research and Development Command.

The study involved several families of equipment and was to determine reliability in terms of the length of time that each type could be expected to operate below failing. The results showed:

- AN/GRC-27. Mean time to failure of the AN/GRC-27 communication equipment was found to be 593 hours.

- AN/BPS-3. Mean time to failure for the AN/BPS-3 homing gear motor was found to be 74 hours.

- AN/AEG-1. Mean time to failure of the AN/AEG-1 radio system was found to be 30 hours.

The most complex systems studied for reliability to date is the AN/FSQ-7 computer used in SAC's Semi-Automatic Ground Environment surface detection system. The computer averages 10,000 electron tubes, 170,000 diodes, 74,000 resistors and 180,000 capacitors.

Techniques used to attain maximum reliability have resulted:

- Computer development. Special computer programs for each task using state-of-the-art logic.

- Elimination of control. Failures have been reduced by controlling both in a position and bursts throughout the computer.

- Test procedures. Test programs have been established and are run on a regular schedule in an effort to eliminate random failures.

In general terms, Col. Lambart said the Air Force reliability program can be divided into three phases—efforts to at least the state of the art, modification of all specifications to include reliability, and finally, continued efforts to see that they are implemented and enforced to insure that only the highest quality,可靠可靠的 equipment is used in manufacture of USAF equipment.

A two year study by Aerospace Radio Inc. compared the reliability of electronic equipment purchased by military agencies with equipment manufactured by civilian organizations. The study showed that the reliability of both equipments was the same, but that military equipment used more than 10% more components in attempting to meet

the standard of the ARINC code so that military reliability, even though with a final training, regular repair spent on a trial-and-error basis, equalized over component after another in order of likelihood until the equipment operated again.

The 30% waste was found to be pro-

mately a dozen major shafts were the worst offenders in the equipment under test (the AN/ARC-27). ARINC has concluded that the only probable solution to the problem is the design of less complex equipments or equipment that can be more easily maintained.

Congress Reconvenes, Begins Push To Provide More Defense Money

Washington—Congress reconvened last week and promptly began to act for more progress and safety for science and defense.

House Appropriations Subcommittee on the Armed Services immediately began consideration of the Administration's supplemental request for \$1.7 billion in new fiscal 1968 funds pending for:

- Construction of dispersal and alert facilities for the Strategic Air Command—\$191 million.

- Establishment of a ballistic missile detection system—\$129 million.

- Development and procurement of long-range ballistic missiles and the construction of ballistic missile sites and ballistic missile laboratories—\$681 million.

- Semi-Automatic Ground Environment System—\$29 million.

- Establishment of the Advanced Research Projects Agency under the Secretary of Defense—\$10 million (see page 36).

These funds would be taken from money already appropriated for other programs. The President and the new agenda planned by Defense Secretary Neil McCallum will be open while, for the moment, the development of advanced weapon systems, including antiaircraft and other space projects, the development of an antiballistic-missile system, and other special projects (AW Nos. 25, p. 76).

Rep. George Mahon (D-Tex.), chairman of the House subcommittee, estimated that his group would complete consideration of the new fiscal requests within two weeks.

Rep. Charles Briscoe (D-La.), high ranking member of the Armed Services Committee, proposed a Joint Committee to Study the Problem Relating to the Navigation, the Use and Control of Outer Space. A measure by Rep. Kenneth Kefauver (D-N.J.) also proposed a new House-Senate group on outer space.

Defense Reorganization

Washington—President Eisenhower told Congress last week he will soon propose some reorganization of the defense establishment in an effort to increase joint service efficiency.

McGovern gave no details but indicated that more power would be vested with the Secretary of Defense, reflecting a change total toward the single man government in the new Advanced Strategic Projects Agency. A major requirement, he said, was a close collaboration of the military services to fully stimulate civilian activity."

In his State of Union message the President and the Administrator of Project 2099 budget requests for defense, science and education will be about \$4 billion short that ended at Fiscal 1957.

Despite increased defense expenditures the President and his staff began to believe the budget in "nothing expenditures on less essential military programs and maintenance, postponing some new civilian programs, transferring some to the states and terminating or eliminating others."

Defense projects scheduled to receive account approval in Fiscal 1959, the President said, include:

- Strategic missile warning system.

- Protection and dispersal of Strategic Air Command and Navy striking forces.

- Long range missile programs and other effective missile systems.

- Most advanced aircraft.

- Nuclear weapons and reactors.

- Advanced missile development.

- Any new type of mobile forces to deal with local conflicts."

The President also called for maximum in military and scientific and a "long and lasting" research and development progress. He will ask "for additional increases in basic research funds, including a doubling of the funds available to the National Science Foundation for this purpose."

Johnson Pushes for Control of Space

Washington—Admitting the future that control of space will mean control of the world, Senate majority leader Lyndon Johnson (D-Tex.) said last week the present Congress is faced with "a task that will occupy and dominate the Congress of five men for life tasks to come."

Defers to foreign policy, he said, will dominate the session, and "the problem of propulsion will be the major factor in legislative activity," Johnson said.

Review Findings

Reviewing the findings of his Task Force investigating Schenck's activities before his election, all Democratic senators—Johnson and the cynical Southerners who sit east and west have largely kept quiet—and the loose-limbed, tactless, and good-humored—has weighed its capability to inflame.

The exploitation of these capabilities by men of whom purpose holds the awful threat of a world in subjection," Johnson said. "The masters of such capabilities by men wholly dedicated to freedom possess instead, the prospect of a world at last liberated from human, libidinous or last form fear of war."

Thus far, the subcommittee has heard 34 witnesses and conducted 193 to 200 staff interviews with military, naval, government officials, industrial leaders, scientists, engineers, and clergymen.

Industries addressed sensitively submitted to testify as:

- Donald Douglas, Sr., chairman of the board of Douglas Aircraft Co.
- William N. Skurnik, president of Boeing Airplane Co.

- Ben P. Hersey, chairman and president of Convair Wright Corp.

- George M. Bushnell, chairman of the board and president of the Martin Co.

- Charles C. Collier, president of Northrop Aircraft Inc.

- Dan Knobell, president of Armetec General Corp.

- J. H. Kistelberger, chief executive officer of North American Aviation Inc.

- T. G. Langford Jr., vice president of Convair Division, General Dynamics Corp.

- Robert E. Gross, chief executive of Lockheed Aircraft Corp.

- Lawrence Hyland, Hughes Aircraft Division Hughes Tool Co.

- Merritt E. Kelly, president Bell Telephone Laboratories.

- Gen David Sarnoff, chairman of the board Radio Corp of America.

White House Budget

Other Developments

- Gen Thomas D. White, USAF Chief of Staff told the subcommittee the Administration had reported low priority before even paper airfields for acceleration of the Atlas and Titan intercontinental ballistic programs. Now that the supplemental budget request enough ICBM funds, Gen White said, there's no reason at all in the Titan pro-

Sputnik Rewards

Moscow—Russia has posted out money and honorary awards to personnel and organizations which played leading roles in building and launching the Soviet Union's first Earth satellite.

A large group of scientists, designers and "experts" has been given Lenin prizes. The title of Hero of Socialist Labor was conferred on personnel who built the Sputniks, the inter rocket, the launching stage and the receiving station. One of the awards was awarded to academic institutions which took part in designing and launching the Sputniks.

Accomplishment was also made of a decision to recompense the launching of the first Earth satellite by awarding us orders in Moscow.

gen was prompted for, he said. Gen White also said USAF is "presently not getting enough married members for example for that transition period."

- Lt Gen James M. Gavin, USAF, deputy chief of staff for research and development, told the subcommittee he is remaining after 30 years service because he can get nothing done about what he termed the "severely deteriorating position of the Army." Gavin said that, when he came to Washington four years ago, the Army had 27 divisions and a \$12.8 billion budget. Now it has 15 divisions and an \$8.6 billion budget. He advocated an "optimum" Army of 28 divisions to meet "one challenge after another."

Under the scope of the space age,"

Protonium Issue

Toronto, Johnson had quoted Gen as saying that Army Chief of Staff Gen Mariano Tinoco, called him a 30 day after his first appearance before the subcommittee and told him he was no longer being considered as a potential. Gavin later denied the press was informed he demands and said he was quite partly because he cannot honestly defend the fiscal 1970 budget.

Despite urging by the subcommittee and Army Secretary William M. Stewart, Gavin said his decision not to remain as chief.

- Rep Alvin Hyman, G. Blachowicz told the subcommittee, the most serious of the sources of his administration's problems was the lack of leadership that he would say he left alone. Rock, over emphasized the lack of trained people knowledgeable in those who have no responsibility, lack of sense of urgency among top scientific officials and red tape and endless controversies. His said

he is afraid that it is almost too late to match Soviet achievements. Rockwell also said he recommended a missile submarine last year, up but "the administration" buried it down.

Bork Disputes Recovery

Adm. Arleigh Burke, Chief of Naval Operations, later and the submarine designed to carry the Polaris ballisitic missile were not built earlier because it was not certain that the missile could be perfected.

Adm. Burke also said Navy will develop an antisubmarine pipeline "in the next couple of years." It will be a long lead and submarine warfare plane. Britain's Ministry of Supply said the Navy has appropriated it on the grounds of making a Boeing Phantom Firing boat rise in usefulness, as a cascading antisub

marine that strong now with the growing importance for more enclosed waters.

Quoting to "a military salesman," Burke said portion of this site leads to "its almost inevitable conclusion—abolishing Congress and making the people's elected chief executive a figure head and place our future in the hands of a single military National Protection."

Burke also said Navy will forge another atomic reactor in this year's budget in order to get more and more effective atomic equipment and will be expect Polaris to be aboard ships by 1969.

Navy Atom Plane Plan Disputed by Rep. Price

Washington—Joint Congressional Atomic Energy Committee is determined to block Navy's plan for an atomic-powered seaplane proposed by Chief of Naval Operations Adm. Arleigh Burke.

- Rep Melvin Price (D-Ill.), chairman of the Armed Services Committee on Research and Development, and the chief of the Navy plan would be to delay the Air Force's aircraft nuclear propulsion program for "at least three or four months" while the Navy's program is reviewed and evaluated.

He said USAF was having a program to move forward on a "crisis" basis which he estimated would save that a reasonably good" atomic-powered aircraft could be flying within two years.

The program still lacks approval by the Department of Defense and the White House Price said.

"The Navy, I think, up until the present has been most little interest in the nuclear aircraft program, now propose to take over from the Air Force a large part of the administration's responsibility for aircraft and engine development. As a result of its financial reality and capability, he



Douglas, Brucker Inspect Thor

Air Force Secretary James H. Douglas and Army Secretary Wilber M. Brucker at inspection of typical field layout of Air Force Thor intermediate range ballistic missile system. The top defense officials, along with military and scientific leaders for the first time see Thor with its associated ground support equipment at the Douglas plant, Elgin City, Okla. The 265,000 lb-thrust missile is displayed fully operational with engines of its launching vehicle.

to the Air Force and Navy on that issue, the project has more open eyes than ever to a widespread of redesign and rework, with the prospect of another such group being set up to achieve the right between the Air Force and Navy.

This project to produce a nuclear weapon has almost already been studied to death over the years of an existence. At least we say, I think there have been no less than 100 or 100 expert panels and committees who have reviewed the project from time to time, some of them automatically.

"What that program needs is action, not another study group."

"To the committee, the Navy should continue its important studies directed toward possible naval uses for a nuclear reactor."

Urging that USAF be given the "go ahead" for its acceleration plan, Price continued:

"We add defense atom plan we need it now on the strength nuclear propulsion program. It is a race for first decisions on the objectives we are racing far and on the cause, we are to pursue in reaching those objectives."

Kefauver Favors Jupiter

Washington—Sen. Estes Kefauver (D-Tenn.), senior ranking Democrat on the Senate Foreign Relations Subcommittee, believes the Army's Jupiter intermediate range ballistic missile is a "possible weapon but is depicted as an Army's threat."

Testing a corollary of Kennedy's position last week with testimony given before the subcommittee that Mr. Kefauver will believe "the Army's guidance and control system is superior and more reliable than those contained in the Thor." Army's guidance system is lighter "so as to enable possible a large payload," Kefauver said.

"The Air Force is committed to heavy, expensive, unreliable missile launching sites," Kefauver said. "The Army uses a mobile single platform which a platoon on the ground can be transported like a truck to fire." An Army spokesman has insisted that they do not need Jupiter and have endorsed the Army's lack of weapons system concept and lack of supporting equipment (AWW Dec. 10, p. 20).

Kefauver also said it is "concerned that Army's missile system, as opposed to USAF's missile system, 'will lead time very substantially'" by having to wait the group and people who must play a part in making decisions in one place.

There is a serious question, Kefauver said, "as to whether anyone who has developed and has been involved and played with another service who understandably feels that he has been discriminated the Thor."

"The question has been raised as to whether under these circumstances, the Air Force might make full use of the Jupiter."

Defense Secretary Neil McElroy may be reconsidering the decision to prohibit both weapons (AWW Dec. 10, p. 15).

Eisenhower, Rockefeller Group Back Advanced Research Agency

By Claude White

Washington—General Postponement plans to create a new Advanced Research Projects Agency received strong support from both the House and Senate.

President Eisenhower asked Congress for permission to transfer \$10 million from other funds to start the new Defense Department agency.

With widespread Rockefeller Bush and report on international security recommended that the Secretary of Defense be given direct authority over all research, development and procurement.

That far, only Postponement action toward creation of the new agency passed.

In

the recognized duplication of

Rockefeller Conclusions

Washington—Report of the Rockefeller Trustees Fund on the military aspects of international security recommended major postwar planning and appropriate funds to assist America in the next 20 to 25 years. Conclusions of particular importance to the report and related initiatives:

- Military departments should be removed from the element of operational command.
- Operational soldiers forces should be organized into small commands to perform missions which will be called for by strategic requirements.
- Chairman of the Joint Chiefs of Staff should be designated Principal Military Advisor in the Secretary of Defense and the President.
- Still of the Joint Chiefs should be organized on a combat basis and placed under the control of the chairman.

• All efforts should be made to integrate general or equivalent should receive their permanent promotion from the Department of Defense and would become officers of the Armed Forces of the United States.

• Line of operational command should be from the President and the Secretary of Defense to the functional commanders through the chairman of the Joint Chiefs of Staff.

• Line of logistic command should be from the President through the Secretary of Defense to the head of the three military departments.

• U.S. must make a concerted effort to meet the joint security requirements of all partners in the alliances in which the U.S. participates by contributing to the development of a common defense strategy; initiating or terminating an attack focus by focusing political influences and by economic and military cooperation.

• U.S. must pool with NATO scientific and technical information and provide mutual research and delivery systems.

• Civil defense must be part of the overall strategic posture. A program must be established to include a warning system and fallout shelter.

• Defense expenditures must be measured substantially over the next few years. Specific recommendations include the following:

- Adequate personnel to administer existing units should be authorized by the 1950s while the U.S. plans for the rapid development of operational command units, strategic and operational units, military intelligence.
- SAC and theater commanders should be made less vulnerable to surprise attack through dispersion and other protective measures.
- Authorized research and development support should be provided for such key programs as missiles.
- Authorized troop transport should be authorized.
- Programs of equipping both surface and underwater ships with results of various types should be accelerated and additional funds for anti-submarine defense should be provided.
- Military pay scales should be used to retain skilled officers and men.

weapon systems and the training needs of scientific talent, the report charges that policy makers, such as the Defense Secretary, are continually being forced to compromise after listening to advice from the armed forces.

Nevertheless, the report says, are placed upon the managers of its advanced sections instead of mission being redefined to conform to an evolving technology and to new military priorities.

The report cites the example of USAF's responsibility to provide airfield for the Army. The airfield is an Air Force mission that suffers from inadequacies where budgets are tight and the Air Force naturally favors its main priority tasks of fighting in the air. Meanwhile, the two parts of the Army are precluded by the administrative assignment of resources from developing and operating the transport aircraft required to move forces swiftly to the combat zone.

Direct Appropriation

The report suggests that, if the Defense Department has a direct appropriation for research and development with the right to cancel it without notice, progress there would be better exploitation of technological advances.

While technology is not without trouble, the report says, "the technical aspect of our defense planning usually is solved problems either of procurement or of cost savings."

But today, with technology developing at an explosive rate, the direction of both research and development is a pressing strategic concern.

As a result, another way may still be won or lost in the laboratories and in the drawing board.

As long as the Secretary of Defense cannot shape the direction of research and development or procurement, he will be, by the essential process, the arbitrator, despite his formalized independence.

Where one depends on keeping up and staying ahead in the technological race, it is essential that one keep one's development reflects a clear sense of direction and not a series of emergency purchases.

Apparent Endorsement

To the best of his mid-November knowledge that he placed in writing, the report to Postponement recommends that he plan to continue a single manager for the development of foreign intelligence, military intelligence, and communications. He also tends to suggest that the proposed changes not be in a possible reorganization of all roles and missions. The Rockefeller report appears to endorse the ARPA idea with the added admonition that new weapons projects should not originate with the service in question but should result from high-level political deliberations and be assigned to

Four new MOTORS for MISSILES

by EEMCO



EEMCO Type 6-612

Designed by EEMCO for military high altitude applications, this motor develops 600 rpm at 1500 VDC. It is capable of continuous vibration testing with maximum loads up to 1750 lb. It is capable of withstand vibration at constant speeds up to 150 G's. It is a compact design with a weight of 10.5 pounds.



EEMCO Type 6-1502

Designed by EEMCO for extremely high altitude applications, this motor develops 600 rpm at 1500 VDC. It is capable of withstand vibration testing with maximum loads up to 1750 lb. It is capable of withstand vibration at constant speeds up to 150 G's. It is a compact design with a weight of 10.5 pounds.

SPECIFICATIONS: Watts: 25 watts DC 24 to 30 volt

current. Resistance: 65 ohms at 6.6 VDC

Weight: 10.5 pounds. Military Specifications: MIL-M-2512A. Test: 150 G's. Test speed: 1500 rpm.

Test load: 1000 lb. Test time: 10 minutes.

Test frequency: 10 Hz.

Test amplitude: 100 G's.

Test temperature: -40° F.

Test humidity: 95% RH.

Test pressure: 1000 psi.

Test altitude: 100,000 ft.

Test shock: 150 G's.

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Test



Corsair's F/A-18, famous all-weather interceptor of the U.S. Air Force, is one of more than fifty types of turbine-powered aircraft using Hamilton Standard equipment. Before engineering, research, and development, and years of operation, stand behind Hamilton Standard's leadership in precision for outstanding aeroflight or propeller drives.

Precision • Strength • Air Conditioning Systems • Fuel Control • Valves • Power • Electronics
HAMILTON STANDARD, INCORPORATED, CINCINNATI

the service according to their strategic needs.

On roles and armament, the Rodd-Baker report is specific—interceptor roles is "left up to the commanders which themselves are encouraged to consult with the operational forces."

The report recommends that the Army, Navy and Air Force be relieved of their responsibilities for carrying out particular combat mission. It urged that the operational forces should be organized into unified commands to perform specific missions, armed with whatever funds, men or aircraft needed to do the job.

Crucial Factor

Of particular interest in the assault industry is the report's conclusion that the last time factor has never been more crucial in the aerospace industry.

"Many weapons or jet fighters purchased last year are listed in the report as numberless weapon in the Department of Defense."

In part they have been caused by a quest for preference in development and in its military attack which is an ever-increasing with the avoidance of mistakes," the report says.

"At our present rate of growth, it has followed the popular course sets a system of awards that favors certain and avoids others."

"Penalties for failure is rare, but punishment is swift and harsh for mistakes that were exaggerated, risks and failed."

Defense Cost Systems Attacked by Industry

Washington—Defense Department proposed will at Congressional Committee Cost Principles is under fire from industry on the grounds that it would discourage defense contractors to work well because, be costliest and most difficult to objective.

The cost principles are included in a proposed revision Section XV of the Armed Services Procurement Regulation, in circulation for industry comments from early last September. The National Security Industrial Agency has fully and completely rejected the draft, charging that it would force defense contractors to work outside their cost, plotting an airtight lid on a design.

NSIA, in a letter to E. Pauline McGate, Assistant Secretary of Defense for Supply and Logistics, lists seven objectionable features of the proposed principles, charging that they would force companies in a strong negotiating position, open the door to special treatment and limit the right of management to make decisions in performance of the contract.



Republic-Assembled Alouette 2 on First Flight

First Alouette 2 assembled by Republic Aviation under its initial test flight. The French-designed, jet-powered helicopter was built from components flown to the United States by Sud-Aviation. French aircraft firm Republic's first will place in its own workshops, carrying out plans to produce the helicopters here. Engine is 400 hp. Turbomeca Arturo II.

Navy Plans Expansion Of Ordnance Facility

Major structure

in a \$175 million

construction program of the Naval Ordnance Test Station, China Lake, Calif., will be a double-bay hangar 244 ft. x 495 ft. with a 100-ft. overhead center on the roof of the entire building.

Other construction will include a 12,000-sq.-ft. cold-assembly shop, aircraft parking areas, storage, repair plant, addition to the existing heating system, telephone exchange and communication systems, access roads and an auto parking area.

News Digest

Sir Abbott Venables-Roe, founder of A. V. Roe and later president of Standard-Roe Ltd., died Jan. 4, 1955. On June 3, 1958, Sir Abbott became the first Englishman to fly a heavier-than-air machine over British soil, piloting an aircraft of his own design.

Premier dies; investigation hearings

are resumed and the CAB has work to

bring fighter jets into service. Testimony resumed by the Air Transport Association

Douglas Aircraft's C-133A completed its first transatlantic flight. Piloted by crews from the 8607th Air Transport Wing, MATS, two of the turboprop

transports flew the Great Circle Route nonstop from Dover, Del., to Chateaudun, Air Base, France. Total for the 3,890-mi. course was 73 hr. and 21 min. Crossing above 30,000 ft., the pressurized aircraft carried a payload of 43,000 lb., gross weight 115,000 lb. One of the transports made a return flight to Dover after a 15 hr. stopover to refuel en route.

Akula Aircraft applied to Civil Aviation Authority for authority to serve the Siberian city of Irkutsk, recently opened to travel by the Soviet Union's Ilyushin agency. The airline would like to begin service from Novosibirsk with DC-8s and equipment this spring. U.S. State Department also is being consulted on the proposal.

NATO advisory committee, comprising eight flight test units on many fighter, fighter-bomber, strike fighter, Air-to-air and ground attack aircraft, met Dec. 12-13. The French Dassault Escadrille IV and VI, Sud Aviation Breguet Taon, and Italian Fiat G.91. Flight test agents in periodic later the Fiat (AW Dec. 31, p. 8).

Aeroflot Defense Command has been formed under Admiral Jozef Wielgost. Commander-in-Chief, Aeroflot, A joint services command, it will be headed by Rear Adm. Dan V. Gallo, who is Commander Caribbean Sea Frontier, with Headquarters in San Juan, Puerto Rico.

Two Anti-Collision Systems Proposed

One plan using infrared, another using weather radars, are submitted to the Air Transport Assn.

Los Angeles—Two new types of anti-collision warning systems are being explored techniques and the other making use of existing weather radars, seem to be proposed here last week at the Air Transport Association meeting on the air collision problem.

* **Monolithic-Honeywell** proposes a dual-mode infrared system. In one mode of operation, the proposed Honeywell system would go beyond primary warning and indicate which aircraft are aerial collision threats—pending such aircraft are equipped with small transponders because of minor bugs, such as static electrical discharge, account for false signals. Dr. Robert W. Powell, who is with the defense model division, is a primary warning indicator, similar to the one being developed by Assistant-General, aircraft research and engaged with beams.

* **Federal Telecommunications** London has proposed a non-cooperative system which uses interferometric techniques in combination with existing infrared radar to provide collision warning against threat in the forward quadrant. Assistant-General, which originally planned to demonstrate its infrared primary warning indicator to the ATA group, declined the demonstration be-

cause of unexpected installation problems which have delayed the program by several months from the timetable. Seven collectors from wings and intermediate forward Aerials to sense the top of the fuselage of company's DC 3 to top of vertical stabilizer. This is gained by having up the vertical stabilizer for new sensor location.

Two flight time zones have made with each monolithic successful performance because of minor bugs, such as static electrical discharge, account for false signals. Dr. Robert W. Powell, who is with the defense model division, is a primary warning indicator, similar to the one being developed by Assistant-General, aircraft research and engaged with beams.

* **Honeywell Proposal**
Honolulu—Dr. John R. Shadley says the addition of a low cost cooperative infrared beacon on aircraft offers a number of significant advantages over a non-cooperative infrared system. These include:

* Greater range. Aircraft equipped with infrared viewer via device and infrared beam-coupling mirror, it

transmits, to be received, depends upon independent implementation. It also notes, therefore, hopes that the infrared beam to be transmitted can be placed on the map of 4 feet in one dollar." As was discussed, two beams intersecting approximately in inches in diameter, four inches high would be visible at the wing and tail of each airplane. Small magnetic compass element would be used to code the beacon. Beam rate can indicate approximate engine heading.

Aircraft, infrared and light barriers aircraft would be equipped with two beams plus an infrared sensor and mounted without warning complete economy. When an infrared signal from

another aircraft is detected, computer will analyze relative headings of two aircraft and relative bearing be known from aircraft to determine whether a collision is imminent.

Honeywell has conducted limited flight test evaluations of techniques proposed for the new collision warning system. Dr. Harlan says.

Federal Proposal

Federal Telecommunications' London proposal is an outgrowth of basic design developed for space guidance. A Federal authority indicated that no basic aircraft radar could provide some of the collision problem data with required accuracy such as distance to an intruder and rate of change of distance. However, weather radar does not provide data as sensible bearing with sufficient accuracy to provide rate of change of bearing information to the aircraft system for collision radar computation, according to Tolson's Harlan.

Federal therefore proposes to employ interferometric techniques to obtain rate of change of intruder bearing. This involves the analysis of local information in the nose of the airplane and associated cameras which measure the relative phase of echo signals which is based on the intruder's rate of the air plane's own rate.

In a suitable combination of information on rate of change of intruder bearing obtained from the latter plan altitude range and angles obtained from the airborne radar, Federal says it can determine accurately whether the intruder poses a collision threat.

Project proposed by Federal includes an aircraft with a small radar which will display three aircraft which are likely to come within 5,000 ft of one plane. System will calculate and display a small zone on the panel indicator which shows direction of maximum moment to avoid collision. Length of the zone will be a rough indication of the seriousness of the threat, according to Alexander.

System Limitations

Alexander acknowledges that the proposed system is based on coverage of the forward quadrant, but says that dependent on aircraft materials, that may not be the case around other aircraft. Sensors also fundamentally limited to a range which is less than 100 ft as explained in article above, probably because of ground reflections. Thus for an airplane flying at 50,000 ft, the useful range would be approximately six miles, while visibility would drop to less than a mile for intruders flying at 5,000 ft.

Federal system is expected to weigh approximately 10 lb installed and cost about the same as a weather radar—about \$10,000.



707-320 Wing Panel

Wing panel of first Boeing 707-320 is being assembled here at [redacted]. This long-range TTB version will be delivered to Pan American World Airways, which has ordered 15. First of 707-320 transports to come off assembly line.

Bristol-Hawker Form Company for BEA Jet

London—Bristol European Airways is expected to announce its contractual order for some 24 new short-range jet aircraft (AWW Feb. 6, p. 45) sometime in the next few weeks.

Bristol 208 design to be built by a joint company set up by Bristol Aeroplane Co. and the Hawker Siddeley Group, stated to have an edge due to government pressure. BEA is believed to have technically the de Havilland 103 project.

The difference between BEA's on one side and the Transair and Ministry of Supply on the other has delayed announcement of the contract for several months.

A final meeting on the details is scheduled between Lord Douglas, chairman of the state-owned airline and Handel, Wickham, Minister of Transport and Civil Aviation. Announcement of the order will follow that meeting.

Hawker Siddeley and Bristol have agreed that Sir Arnold Hall, director of the Hawker Siddeley Group, will be managing director of the new company with Dr. A. F. Russell, designer of the Britannia engine, as chief engineer.

The firm will be owned jointly by Hawker Siddeley and Bristol in a 60/40 proportion.

The new company will be located in the eastend industrial area of the

two parent companies.

Final changes in specifications have resulted in a 600-plus mph. aircraft which will have a gross weight of approximately 120,000 lb and be designed primarily for short-haul operations.

The Hawker's design calls for Rolls-Royce RB-161 engines, a small version of the Conway fan engine.

An announcement by Hawker Siddeley and Bristol said the Bristol 208 will "use such powerplants as may be specified in the contract." Both Bristol Olympus engines and Rolls-Royce engines are available for the Bristol 103 project.

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Vapour Trails Farm Pattern Over London Airport

Vapour trails create a pattern in the winter sky above London Airport at dusk. Central tower is in the middle, control terminal and lesser docks are at the left.

Polar Route Competition Tempo Rises

By Glenn Garrison

New York-Bethel route for business on the West Coast. Pan American's polar flights to and from New York are now the most successful flights in a rich market where few have the exclusive privilege of Scandinavian Airlines System for the past three years.

Having stagnated these past seven during the midwinter month of September 1957, Pan American World Airways and Trans World Airlines are achieving fairly good factors on the route. So far at least SAS says it is holding its own.

When peak-season schedules go into effect next April, the battle will be joined in force. Meanwhile, neither big foreign airline nor Pan Am is fighting for rights to the market and the other carriers can enter if whenever they choose.

Competitive Positions

A breakdown might cite the present contenders as follows:

* TWA has an advantage over both Pan American and SAS—the Lockheed L-1049 Constellation which can offer the widest nonstop and thus provide the fastest service. Trans World also has a transpolar lead from Far East to the fast direct passengers in the west

third of TWA's flying eastward.

* Pan American, although greater than TWA, can't be beat in a straight Japan-Portland race.

* SAS has been identified for three years as the polar airline that punctuated the service throughout the winter.

The Scandinavians' current new values only Los Angeles-Copenhagen service in the north. Although it is seeking nonstop at San Francisco, TWA flies from San Francisco and Los Angeles, Seattle and Portland on the West Coast; London and Paris on the Europe run.

Polar Schedules Weekly

SAS presently has five schedules weekly to each direction to Pan America and four to TWA's Tokyo hub. Pan American will match SAS in April when each carrier operates eight weekly transpolar flights. TWA will go to four flights at that time.

With Pan American in three sectors the east as far as the Americas can be covered, TWA can claim the first in annual basis. Its long-range flights usually fly nonstop eastbound and often can make it westbound without touching down to refuel. The airline won't actually schedule the eastbound flights as nonstop, but doesn't hide the possibilities.

Transavia for TWA's operation through San Francisco on the polar route shows eight nonstop performances out of ten of the surface Los Angeles-London flights. Westbound, that nonstop flight also serves San Francisco and made it to that city nonstop from London those four out-of-route routes. Scheduled nonstop in 19 hr., 10 min. eastbound 21 hr., 25 min. westbound.

Best time so far on the eastbound flight according to TWA is 16 hr., 14 min. from Dallas to London.

Carries other polar flights, Los Angeles-San Francisco-Paris and on to Rome, occasionally has two transatlantic services San Francisco and Paris via a transoceanic Paris and Los Angeles is 15 hr., 45 min. eastbound, 22 hr., 3 min. westbound.

TWA plots its polar flights over minimum time routes worked out by a wind analysis unit at New York International Airport. Average minimum time mark Los Angeles-London, the shortest route, is about 17 hr., 30 min. and actual time has often come close to this after corrections within a minute. Traffic on the Los Angeles-London flight through November was running about 75 passengers eastbound, about 30 westbound. In the fall passengers arrived on aircraft TWA regards the capacity as roughly four up about 18 to 15%. The other flights each carried about 40 passengers eastbound and westbound, with similar numbers last month.

PanAm Patterns

Pan American operates some of its DC-7C polar schedules in what seems an unusual or strange pattern. Two of its four world nonstop flights originate at San Francisco in North America, one hour and thirty minutes from Los Angeles and direct flights from Los Angeles for Europe usually with a fuel stop at Tedderick Bay, British Columbia. A third flight is named Los Angeles-San Francisco-London and the fourth flight arrives San Francisco-Portland-South London.

The doublets link of San Francisco-Los Angeles arriving Los Angeles via enroute gateways Los Angeles passenger gas with a better winter. Instead of starting out eastbound and landing sometime at San Francisco, the passengers need a stop at that city although Los Angeles is by far the larger market and the San Francisco-Los Angeles gate has direct nonstop flights to and from Los Angeles and San Francisco-London.

Scheduled times of Pan American's northwest polar flights range from 21 hr., 30 min. Los Angeles-San Francisco

London to 22 hr., 35 min. San Francisco-Los Angeles-Panama. Westbound, schedules range from 23 hr., 30 min. London-San Francisco-Los Angeles to 24 hr., 40 min. Paris-Los Angeles-Tokyo. All schedules include a stop at Honolulu 4 hr., 45 min., although some points are intermediate used by the fuel stops because of straightforward economics.

Pan American is flying all mixed DC-DC flights, with emphasis varying as to proportion of each class sold.

SAS, now operating one all first class and four mixed weekly flights in its

DC-7Cs, postponed the polar route in 1954 and had carried 64,110 passengers by the end of its third year of operation last Nov. 15. During that time the Scandinavian carrier flew 746.5 hours on average passenger rates on the route in 1,700 flights.

Scheduled time in SAS's planes is 20 hr., 10 min. eastbound, 25 hr., 20 min. westbound. Its eastbound aircraft carry 56-54 tourist seats, 12 standard flat class and eight sloper seats and a lounge. West class configuration is eight sleeping, 12 first class and 12 domestic seats, plus lounge.

Despite the new competition, "we're doing very well in the polar route," Werner E. Koenigs, SAS president said, and added told AVIATION Week Koenigs said his wife is joining the effort of the American's and SAS's entry into the market, because it hasn't been fully set up.

"Now the game begins," Koenigs commented. SAS lead factors on the route have averaged 75% in both directions, and have yet shown no signs of tapering off.

Koenigs feels that the greatest future potential of the polar route will selling



Northeast's Executive Lineup

New Northeast Airlines President James W. Austin (center) stands with his Board of Directors in the jet. Austin is former vice president and vice chairman of Capital Airlines. With him is Nelson B. Fry (right), Northeast assistant vice president of traffic and sales. At left is George Gondert, Northeast president who becomes board chairman and continues as executive officer.



Continental's First Viscount Flies



Continental Airlines first Vickers Viscount, the first Viscount 800 produced by Vickers Armstrong, made its initial flight from Wycombe, recently. Flying the aircraft was Capt. R. Konig. The first deliveries of Continental's 15 Viscounts are reported as early spring. Modifications on several aircraft may undergo changes before initial delivery is made. Note propeller tip vapor locken visible in both photos.

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Vertol Aircraft Corporation
Marlton, Pennsylvania

Industries design offshore oil apparatus for small platforms even under increased conditions and in great heights unimagined by anyone until

government cannot require an eight aircraft to meet the base published in schedules.

The airline and "government" legislation cannot deal with performance; it can deal only with problem of performance.

It added that, even though the specific concept of scheduled flights are prohibited by the airlines, there are undoubtedly what it means is that the reason is prohibiting that the aircraft will depart or arrive at approximately that time.

The airline asserted that it would often be possible to predict arrivals and departures with a high degree of accuracy if the prediction was made on schedule prior to each departure. It said it knew that, although the Air Transport Association does not publish its public records to know operating times, the public needs to know operating times, and that other work is already.

The Air Transport Association wanted to act as petition for reconsideration that the administration, regulators and enforcement of the regulation would force some carriers to adopt a "plus or minus" type of scheduling or a system where schedules would be matched out in chronological the closest type of trip.

In such cases the ATA and our own would stand convicted out of their one month since the rule goes into effect that the regulation shall not be construed as interfering scheduling or rules as to contribute, unreasonably or ridiculous management?

**Hughes Stock Plan
Proposed by Examiner**

Washington—Establishment of setting trust for stock held by Howard Hughes in the Alas Corp. to prevent possible dual control of Trans World Airlines and Northwest Airlines has been recommended by Civil Aeronautics Board Examiner Paul N. Fleischman. If the recommendation is approved by the board, an organization of the Hughes TWA-Airwest merger will be formed and one new stock will be brought to the market.

In his conclusion, Fleischman stated that the two stocks now stronger than the proposed voting trust procedure would be an order requiring Hughes to sell his Alas shares. He said the "psychological impact" on Wall Street of the disposal of Hughes holdings amounting to 10% of the outstanding Alas stock, could cause losses to those who buy Alas stockholders.

If the recommendation is accepted by the board, Hughes would be permitted to retain his stock in Alas which holds a 10% interest in Northwest, but a trustee designated by the Board would take the stock. Hughes also controls 27.5% of TWA stock through his Hughes Tool interests.

AIRPORT WEEK, January 13, 1968

**Tipton Outlines Airline Proposal
To Curb Operation of MATS**

By Ford Eastman

Washington—Stuart G. Tipton, Air Transport Association president, presented a nine-point program last week he said would strengthen both the position of U.S. airlines and fulfill national defense airlift needs.

In testimony before the Subcommittee on Military Operations of the House Government Operations Committee, Tipton said airlines should receive greater priority than military traffic carried by the Military Air Transport Service. Thus, he said, would provide the funds airlines need to modernize and extend their fleet which, he said, would service the nation's airlift as quickly. Southerly jetshuttle was protested.

On Jan. 7, Tipton told the committee that the Air Transport Association executive director, Carl J. Doyle, independent Airlines Association executive director on behalf of the nation's supplemental carriers.

Following Tipton's program, which is effect calls for all military traffic to be curtailed to be carried by civil air lines.

• **Military airlift requirement** should be determined by the Defense Department.

• **Military requirement** for civil commercial operations both domestic and international, should be determined by the Civil Aviation Board or the chairman after consultation with the State Department.

• Above two requirements should be combined and the total civil air carrier capability measured against the combined national wartime requirement. Subtracting the total civil capability from the total national requirement, he said would permit the calculation of the airlift deficit which could be provided in the future.

• **Military aircraft** or sufficient quantity and type of aircraft should be retained by the Air Force.

• **Potential military airlift requirements** should be determined by the Defense Department and forecast for far into the future as practical.

• **Civil air carrier industry** should be invited to move that traffic in its own aircraft—either in common carriage or its scheduled airfares or in charter.

• If the procedure followed in the above step results in all of the passenger traffic traffic being accommodated, the airlines' interest in MATS transport fact should be maintained in a contract of constant radius.

• If the possible losses some of the military procurement requirement were reconsidered, the Air Force should make available enough of the MATS fleet for

loss to operators for the specific purpose of moving military traffic.

• In the event that their predominance to produce sufficient lift for the planned military requirement, the Air Force could establish a baseline program or operate scheduled trips, pursuant to contract with its own equipment.

The Tipton program suggested by the Air Transport Association is not yet in final form, but is generally acceptable. Under that program, civilian airlines would transport 30% of the passengers and 30% of the cargo carried by MATS. This has beenрагged earlier in the Senate Appropriations Committee.

Doyle also proposed the creation of the nation's Civil Air Transport Adminstration.

He said:

"We are frankly alarmed that there is no such agency in being at this time. No commercial operator of long-haul aircraft knows what will be expected of him in the future. Can such fine military services have no set rules which will happen to those domestic airlift in the same situation?"

The hearings will continue this week with testimony from the Commerce Department, Civil Aviation News and Air Force interested in tenth.

Challenge by Aeroflot

Washington—Air Transport Association President Stuart G. Tipton warned last week that Aeroflot's Soviet state-owned airline is rapidly preparing to challenge the importance of U.S. domestic and international long-haul carriers. Russia's long-range planning in the field was reported by Aviation Week on July 9, 1966, page 264.

Tipton told the House Government Operations Subcommittee on Military Affairs that an effective Russian civil air transport organization such as the Soviet Union's building will provide the soon to be established Aeroflot with a large and efficient economic development and leadership crossover perspective. He said it also will serve as a valuable test political influence and act as an effective propaganda weapon.

The 480-jet backlog numbers on order by U.S. airlines, Tipton said, will provide an annual airlift capacity of an estimated \$4 billion transoceanic in normal operations by 1980. Under unusual emergency conditions he said, the fleet could provide more than four billion ton-miles of airlift annually.



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TALOS



That's Talos launching from the RCA Defense Display on Dec. 12, 1962, headed to clear skies above Africa.

The RCA Talos Defense System is the first completely electronic land-based system for launching and guiding missiles, and utilizes the Talos Missile developed by the Applied Physics Laboratory and produced by Bendix. The Defense Unit receives target signals from remote outputs, analyzes them with regard to number of stations, location, course and speed. Next, computer determines the logical points of interception, under the missiles loaded on launchers, guides them at supersonic speed to the vicinity of the target, after

which the missiles "lock" on the target and close in for its destruction. All without even the touch of a button! The RCA Talos Defense System, with its electronic equipment and guidance system, was designed, developed and built by RCA as prime contractor, aided by many subcontractors. It was turned over to the U.S. Army on October 13, 1961, and is a reliable interceptor, exemplifying the continuing determination of American enterprise to secure peace with honor and justice.



RADIO CORPORATION of AMERICA

DEFENSE ELECTRONIC PRODUCTS

CAMDEN, N. J.

SHORTLINES

► American Airlines has added new nonstop service between Philadelphia and Los Angeles using Douglas DC-8s. Schedule: Philadelphia to 10:55 A.M. CST Monday through Saturday, with stops at Newark, Buffalo and Chicago. Arrival at Los Angeles is scheduled for 12:10 P.M. PST. This intra flight will have 11:10 P.M. PST departure stoppage at St. Louis, Chicago and Cincinnati and arriving at Philadelphia at 3:30 P.M. EST.

► Continental Air Lines will celebrate its eight and ninth, first began two and a half years ago. The airline says could not hold have proved to be the right route with company records showing an 80% 1959 of gross sales being derived from the two cities. The Continental plan allows the market to place its resources in the market agent and receive the tickets he mail.

► North Central Airlines closed 1957 by carrying 495,000 passengers to December than during the same period of 1956. The airline carried 31,750 passengers during the month as compared with 35,746 during December, 1956. The airline also flew 887,100 scheduled miles in December, an increase of 38% over December, 1956. North Central will celebrate 10 years of scheduled service on Feb. 24.

► Clark Air Base set a new December passenger record for itself by flying 29,201 passengers. The new record is 33,651 passengers greater than the December high set in 1956 when Clark carried 29,152 passengers.

► Pan American is planning a new \$2.7 million plant at its main facilities in Toluca to increase production of the Convair jet aircraft to a possible 100 per month. The company says the new plant would be completed by the end of 1959 when the first jet aircraft production line will be discontinued. The plant will be transferred into the main factory by mid-1959 when four Convairs will be coming off the present production line. Current orders for the Convair stand at 28, with options for an additional 36.

► Trans-Canada Airlines plans to one start a turboprop aircraft overland and transoceanic base at Montreal's Dorval Airport. The new base will cost approximately \$70 million and contain 100,000 sq. ft. The two story building will include an overhead hangar, a maintenance hangar, offices and stores facilities.

AIRLINE OBSERVER

► White House support of Pan American World Airways' fight for traffic rights in Perdido and South on the Transpacific. Gen. Curtis LeMay appears to have been rebuffed by the third time he, the Civil Aeronautics Board, Washington, advanced, before the Board has again reflected its original recommendation that Pan Am be denied those rights in the Transpacific. Recent CAC decision to rule does not justify the earlier Pan Am opposition to the Board's recommendations as far back as Sept. 1. LeMay agreed that he would hold final decision in temporary air absence and asked the Board to review its case in the case of grants of several traffic increases between the U.S. and Tokyo. On the previous occasion, Pan Am had increased the Board's recommendations on Transpacific and South Pacific rights and early this year held the final decision in absence pending a CAB review.

► American National National Airways says it will purchase four Vickers Viscount 810 turboprop transports. Managing Director R. M. Aslett will fly to London to complete the details of the transaction. The purchase will enable the delivery of three aircraft in the last quarter of 1958 and one in January, 1959.

► Bonds between U.S. airlines and foreign carriers continue to widen despite feelings in U.S. circles that the State Department has been overly generous in granting traffic rights to foreign operators. However, a number of foreign airline officials are charging that bilateral negotiations become bogged down and delayed because the U.S. has been too restrictive in opening U.S. routes to foreign carriers. Latest fight between Pan Am and the U.S. in current bilateral talks (AW Jan. 6 p. 43) may result in a final settlement of the 1956 bilateral agreement between the two countries.

► British Overseas Airways Corp. is temporarily canceling out of flights between London and the Far East while refueling modifications are made on the air intakes of its fleet of 15 Vickers 810 turboprop transports. Modification program calls for a one-by-one removal of the intake from scheduled service.

► Capital Airlines has adopted a program designed to combat effects of turboprop flight as the case of general aviation. The airline is conducting a continuing study to determine whether the use of the engines has a dangerous effect upon the health of personnel assigned to areas within range of the Vicksburg caption. Moreover, the airline has issued regulations to personnel who seek a southern distance from the plane and its natural type of protection to people working close to the plane.

► Rolling permitting the exchange of air transportation for shipping goods and services by land carrier and transoceanic airfares has been extended by the Civil Aeronautics Board until next Jan. 1. A petition by the carriers through the Air Traffic Conference to expand the ruling to permit the use of transoceanic by contract status sponsored by the airfreight was denied by the Board.

► National Airlines has been recommended by the Civil Aeronautics Board Council for the Buffalo-Milwaukee route as a basis of Capital Airlines, originally recommended for the route. In November, National Council told the Capital Aeronautics board it explained that the Capital carrier would best meet the demands of public convenience and security should it be established within "the reasonably near future." But the airline could provide an "attractive competitive service over the proposed route."

► Watch for mounting criticism in financial circles of Civil Aeronautics Board tactics in establishing a need for a fare increase. Civil targets will be CAB concept that passenger fares should be determined on the basis of rate of return on deposited assets and the inclusion of capital gains as the sole aircraft in determining fair savings. Investment Bankers Association of America already has recommended that President Eisenhower appoint a highly qualified panel to review the Civil Aeronautics Act and CAB practices.

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WHY T58 IS BEST FOR HELICOPTERS

AXIAL-FLOW COMPRESSOR—12 stage (first stage and inlet guide vanes, shown) is small, compact, advanced design with unique steel construction for last eight stages of rotor blade lifetime. Ruggedness plus maximum operating efficiency.

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GAS CENTRIFUGAL TURBINE—3 stage axial flow design with short ducts reduces cut-backs in weight and reduces drag.

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ANTICOG INLET STRUTS—use air bled from compressor, prevent icing under severe winter conditions.

**ADVANCED HYDROMECHANICAL
CONTROL**—provides operational simplicity, fuel performance, safety and reliability.

FREE POWER TURBINE—single stage, axial flow power turbine is electronically independent of gas generator ... together with advanced control system, this arrangement permits helicopter rotor to operate at best speeds for climb, cruise or hover.



T58 FLIGHT TEST PROGRAM began in January 1967 in University Hillside (left), was recently extended to Vertol H-33D (center) and will include the Kaman HH-3E (right). Comprehensive flight, motor and cell tests have already proven the engine's performance, reliability, control stability and power splitting ability.

Exacting Endurance Test Program Proves Outstanding Durability of General Electric's T58

Official 150-hour Model Test results accepted by the Navy's Bureau of Aeronautics prove that General Electric's T58 engine offers helicopters not only extraordinary performance and operating advantages, but also outstanding durability and ruggedness.

DURABILITY OF THE T58 engine design was thoroughly proved during the 150 hours of rigorous testing, more severe than initial flight conditions. T58 official test results exceeded all performance guarantees. For example, the T58 produced 1035 military hp, compared to the guaranteed 1024 military horsepower. Normal rated SPC, guaranteed at 875 hp, was increased to 932 hp. Both military and normal rated SPC guarantees were bettered.

RUGGEDNESS OF THE T58 engine design was proved by its exceptional performance under the severe accelerating and decelerating, stops and starts, loads and overloads. Oscillating test results show:

- All required 35 starts exceeded specification guarantees. Typical acceleration time to idle speed bettered guarantee by over 40%.
- All engine throttle burst times were well within guarantee limits. Acceleration times from idle to 100% power were four times better than guarantee.

ADVANCED AERODYNAMIC DESIGN. Engine cut away at left shows the advanced design features that make possible the T58's exceptional performance and ruggedness... features that truly profit new levels of military and commercial usefulness for helicopters.

For more information about the T58 call your local G-E Aviation and Defense Industries Sales Office, or write General Electric Company, Section 333-18, Schenectady 3, N. Y.

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AREA-SLIED PAYLOADS and ventral centerline dry tanks designed for thin straight wings are incorporated in T-38 aerodynamics.

Light Turbojets Save Weight on T-38



INDIVIDUAL CANOPIES and windshield are fitted to both cockpits. Using detailed mockup, Northrop test pilots demonstrate built-in steps which elevate seat for ladder.

New family of Fessiller and General Electric high thrust-to-weight ratio turbojets powered Northrop Aircraft's entry with the Air Force in procuring their T-38 supersonic basic trainer as a design concept that would provide mission capabilities equal to more conventional designs with savings in development and procurement costs.

T-38 was designed as a result of parametric studies conducted during the summer of 1955 by Heinkelfeier Air Research and Development Company for the Armed Forces Institute to replace the Lockheed T-33. Northrop also feels that some of the criteria established for the T-38 are applicable, notwithstanding modifications—soft seats, cockpit attitude indicator, dual sheet metal skin. Company is campaigning in a number of French foreign countries with a lightweight intercepto version of the T-38 offering production license.

Cost Savings

Northrop points out that its studies of operating the T-38 and encouraging existing compatible manufacturers to produce that Air Force could save \$75 million in procurement, maintenance and operating costs in a five-year period using 1,000 airplanes to conduct its home training mission. Compatible airplanes, it reasons, can

be built by weight limit the cost and weight of the T-38, the company states.

In developing the T-38 design, Northrop engineers gave considerable aspects special consideration in all procurements to the overall configuration and employment of an aircraft line with performance, according to Willis E. Gandy, Chief Weapon Systems Development Engineer, Northrop Division Hawthorne. Cost, tooling and manufacturing personnel were brought into the preliminary design stage to assure application of modern producibility methods to avoid

Structural Detail

To fulfill objectives of minimum weight maximum use is planned of machined and/or sheeted, welded, drawn, riveted, composite and fiber action of conventional structural systems. Specialized design criteria were centered critically to avoid unnecessary concentration in leading engine, suspension and deflection requirements, he stated.

Net result was that the T-38 control surfaces located skin in order to load all fuselage. All fuel is stored off of cockpit, permitting use of thin airfoil. Cogent weight is 10 in. beyond wet tank.

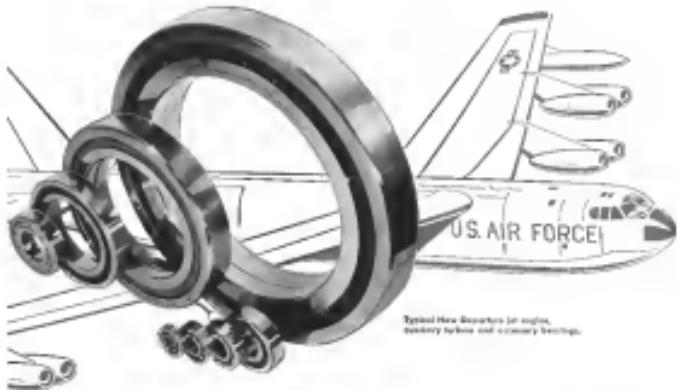


ENGINES ARE LOCATED skin in order to load all fuselage. All fuel is stored off of cockpit, permitting use of thin airfoil. Cogent weight is 10 in. beyond wet tank.



INSTRUCTOR SITE IS higher than student. All controls and switches are located ahead of occupant's normal often position. Dual instruments, navigation and instrument landing system equipment, cruise, re-evaluated to meet performance, service and safety through

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Typical New Departure jet engine, transmission bearing and accessory bearings.

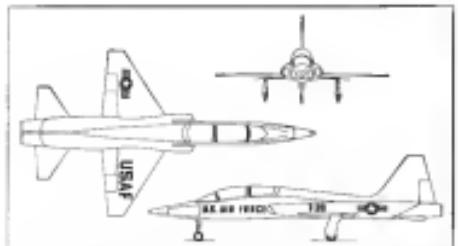
PERFORMANCE PROVED...IN THE AIR!

New records are continually being piled up by America's many types of ultra-fast, high-flying jet aircraft. And these records provide strong testimony as to the reliability of the vitally important bearings—New Departure ball bearings such as the turbine mainshaft and accessory bearings developed through New Departure's extensive Aircraft Bearing Research Program.

And looking ahead to the even more powerful and faster aircraft yet to fly, New Departure is developing ball bearings to help make their flight success complete.



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WIDE TRACK and trend of tricycle landing gear is designed to provide easy ground handling and good visibility. Landing gear is placed far ahead of wings for good visibility.

with approximately 3,000 lb. of maximum airframe weight. If a conventional design approach had been followed, using a single long thrust tailpipe in place of two lightweight engines, the airplane would have weighed approximately 17,000 lb. and would have required a 7,000 lb. thrust engine, Gaasch said.

T-33 Dimensions

The T-33 measures 42 ft. 3 in. long, has 23 ft. 3 in. span, is 14 ft. 11 in. high and has gross wing area of 170 sq. ft.

These dimensions are a fair way of medium range with allowable horizontal tail under the wing chord plane to provide 4.2 seat stability and control characteristics.

The T-33 General Electric 351 or Fairchild J44-GE-351 15,000 lb. thrust engine is used with afterburner, for a total thrust over 20,000 lb.

All fuel is carried in the fuselage, in two sections behind the cockpit. These are two independent fuel systems, one for each engine. Fuel for the right engine is carried in the forward tank, fuel for the left engine is supplied by the center and aft tank. Fuel pressure to the cockpit is provided by balanced electric pumps without requirement for pilot attention or automatic sequencing.

One can run cross deck in case of emergency. The center tank and tail tank is placed so that there is enough hydrostatic head to provide fuel for an afterburner takeoff should the boost pumps go out, Gaasch noted.

Electrical power is supplied by two 6 kw. variable frequency alternators, one operated by each engine, the two systems functioning independently and under normal conditions with current approaching half the load. Automatic shutdown is provided in event of failure of a unit.

T-33 design elements are of a stan-

dard turbine for emergency hydraulic and electric power. Instead, there are two independent hydraulics and electrical systems each powered by one of the two engines.

For ease of maintenance an overhead work deck and a rear engine bay. Front and rear access doors are located on the fuselage and are driven by a gear shaft from the engine gear box, thus eliminating the need for separate rear access door.

Engines are started using a marriage system on the left engine, right engine is started using left engine compressor air bleed.

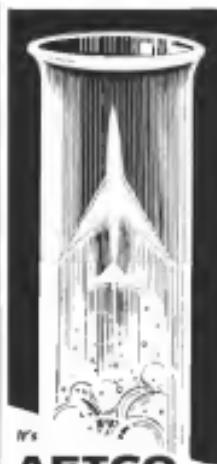
To provide simple working gear in the engine bays, the fuselage aftdeck must be removed by unscrewing four bolts. Carefully in this position, the aftdeck is rotated so that the central vertical tail section is close to the fuselage; when the after section is displaced, Northrop assumes that that fuselage provided a weight saving of 100 lb. over more conventional methods and in addition eases curing of the fuselage skin in high winds.

Hinged Windshield

Aerospace is the instrument panel is provided by hinging the windshield at the forward edge allowing freedom of movement for the pilot.

Wind tunnel investigations show that the T-33 has excellent lift characteristics with lift coefficient increasing with angle of attack well beyond the stall. Gaasch claimed. Adequate lateral control is maintained at angles up to 10 deg. permitting use of aileron for roll control.

Tests also show that longitudinal stability increases as the stall is approached and that favorable cambered airflows beyond the stall. The airplane can be landed with one aileron inoperative, according to Gaasch.



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cycle, AC-DC) and mechanical
IN FLIGHT TESTING





FLYING ARROWS Long nose ML 6 Hawker Hawks. At last Tainborough show, team lined up aircraft at ready field to get into its

RAF Team Maintains Operational Status



North Weald, England-Britain's Royal Air Force Flying Arrows, first of the world's military aerobatic teams to fly five aircraft in full formation sequence, not only performs at displays but simultaneously performs its operational role in Britain as an

At last September's Tainborough air show (AW Sept. 3, p. 26), the RAF team performed its usual five-aircraft formation flights and "steaming" move ML 6 Hawker Hawks at a stand-clearing low-altitude demonstration.

Squadron No. 111 has no more pilots or aircraft than any other RAF fighter squadron and that situation is picked from among the pilots serving as operational test with the unit.

Not Privileged

One major concession that the squadron makes to its aerobatic assignment is that its 16 ML 6 Hawker Hawks jets are painted black rather than the usual RAF blues and greens.

Squadron Leader Roger Topp, commanding officer and team leader, emphasizes that the squadron maintains a

95% operational efficiency even during the summer months when the team performing at meetings are shown. It is not uncommon for a team member to fly an operational mission on his third flight of the day after two practice sessions of aerial acrobatics.

Customarily, Fighter Command passes the honor of putting the RAF aerobatic team into formation to another unit each year. But in 1978, for the first time, No. 111 squadron will supply the team for the second year running.

Royal Air Force believes the fact that the Flying Arrows are part of an operational and explosives, more than anything else, that premium flying of very high quality is the expected standard in Royal Air Force fighter units.

An Manual for Thunder G. File, Air Officer Commanding-in-Chief, Fighter Command, says of Royal Air Force flying on the team that this way "From time to time, certain squadrons are asked to represent the Royal Air Force in displays at home and abroad, so that the public can see for themselves the standard and ability of the fighters they have bought for their defense. This year No. 111 squadron has been selected for this duty and although their show is spectacular this high standard has not been achieved at the expense of usual training. These men are fighter pilots—not stunt performers."

No Official Name

Actually, the Royal Air Force team has no official name. It's also been tagged the "Black Hawks" and the "Tiebolts." Topp has said his folks are those heaps that go to the whole organization. But the Flying Arrows label proved to be the French at the Paris air show has tended to stick officially.

The present team is not the first RAF team to use five aircraft. The Vampire team of No. 51 squadron appeared with six in the 1958 Tainborough display. But the Flying Arrows are the first to submit the idea as a preplanned, international show with high speed steaming at altitude.

Recent behind-the-scenes of the RAF is usually a competition one. The European team of various nationalities often find themselves flying in the same air show as unusual but quite serious competition (AW June 17, p. 36).

"No one has any difficulty increasing a mind if you are the oak from them," Topp points out. But the urge is the competitive European situation to provide something just a little better.

Basically, all we want you do is keep and roll," the RAF leader notes. And from that, you may want aircraft around the leader to make different shapes. With five, you can make



TAKOFF is in a modified fuel formation with No. 2 and 3 digits set with red behind leader. Leader holds takeoff rpm to 7,000, compared to 8,100 rpm of Blaster's Area



ARROW Formation (above) is made with No. 3 and 5 to left, No. 2 and 4 to right. **Card for Formation (below)** establishes the feet of clubs. Team will currently consist of 10 pilots



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shape which can make with them.

The British performance is built around this philosophy and is designed to trim the lead in flights as frequently as possible. For the same reason it is a preference plotted to keep them close to the center at all times.

When the pilots of No. 111 roll out for their home display they have ahead of them a 10 mile run where mistakes are numerous. It is the exclusive for the Flying Arrows to fly the formation in a diamond pattern over Chiswick because they feel it less tiring from leader Topp who finds a Gurney advantage for another reason. Experience with it enables him to do some sort of the pilots' flying instead of working constantly by the Gurney.

Momentum polled during the team's performance in T-4-HG tracked during the bomb burst. To avoid building up formation the Arrows' wheels pull less than 1G in order to maintain low pressure on the tires. Top speed is 600 ft and maximum speed, 150 M.

The Arrows' A-4S are rated at 10,000 ft in the air. Setting a record after many attempts, 7,000 fpm varying slightly depending on temperature and altitude, and economically is used back during rolls.

Takeoff is in a modified four formation with No. 2 and 3 ships set wide and eighth behind the leader. Numbers 4 and 5 are behind them, wide of the leader but on the inside of No. 2 and 3. Topp holds takeoff gas at the lead aircraft to 7,500, compared to the R-100 top for the Hunter Arrows.

At 9600 ft, Topp pulls us down so wheels are up. All of the used radio commands identify the type of turn being coming with "go" or the operative word. The choice here is the basic unit of the five ship team.

In this formation the Flying Arrows sweep back across the field, banking to port, then sweeping to starboard, then sweeping back again at an altitude of 100 ft, to a half-loop with No. 2 and 3 dropping back to fly wing on No. 4, who together with No. 5 hold his position. The team then loops in that formation, coming around the corners as close to a right-angle as possible without going over the crowd.

Completing another loop the unit shifts to a cross as its nose comes up 45 deg above the horizon. In this formation, the wingspan is free-same-level with the center aircraft. Going over the top of the loop at about 80 ft,



ROLLING in basic box formation, the Flying Arrows prepare to shift to . . .



HALF SWAN, with No. 2 and 3 dropping back to fly wing on No. 4, who holds on No. 5

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the main ordnance in basic diamond box and rotates down the runway in front of the crowd after a 500 ft. pull out.

Topp then pulls a wide arc to bring the team in toward the other edge of the crowd, shifting at the end of the arc into a W for an arched loop. This is a somewhat similar shape to the modified loop, but is taken at a much steeper angle on the inside ejection which goes off its tail.

Coming down the far side the team shifts back to its diamond box and does a straight roll in front of the spectators. Going up in the next loop the Avenger moves into full inverted. In this No. 2 and 3 wings are held thus position on Topp with No. 4 and 5 riding in to roll behind them. From the first, the team goes to its slow formation on the far side of the loop. In this, as in the roll, odd-numbered wings are to the left with even to the right.

Fork Simplifies Turn

After crossing in front of the viewer, the team slips back in a fork to rapidly turn and then assumes the at ease position as it once more passes the fire.

Shifting from arrow to hook to box, Topp pulls the team over another loop, coming down the back side in the team's diamond and fire formation, in which it closely resembles the five of clubs. After holding that shape in a box turn the team goes into its spectacular finale.

The fire struts simultaneously start producing wings made in this manner a roll to left in front of the crowd, shifting from the card formation to box while rolling.

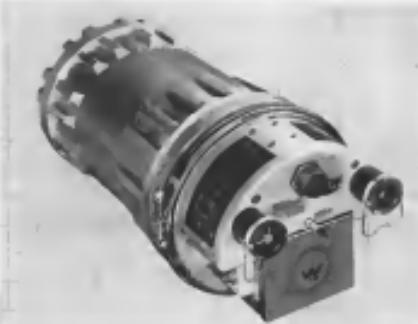
Topp pulls up in a steep loop with his wings spreading to a final hook as thin as they can.

Then comes the harsh burst. At the



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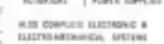
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LOOP: loop or turn. Roll: turns in fixed axes. Formation of beginning and end. In fixed loops or turns loops out of loop lead ship leads straight down. No. 4 and 5 receive through 90 deg. initially, then level off 30 deg. No. 3 and 3 turn through 90 deg. and back off 10 deg. All else, roll out and continue.



Wing over is performed with turns in fixed axes. Turn out is made with turns out of loop. Lead ship leads straight down. No. 4 and 5 receive through 90 deg. initially, then level off 30 deg. No. 3 and 3 turn through 90 deg. and back off 10 deg. All else, roll out and continue.

From loops out of the loop, the lead ship leads straight down. Numbers 4 and 5 receive through 180 deg. initially, then level off 30 deg. Numbers 1 and 3 turn back at 180 deg. Numbers 1 and 3 turn through 90 deg. and back off 10 deg. All else, roll out and continue.

Extreme dives to a 360 deg. pullout and still making inside rolls over a series of evasions. Re-fueling: the nose cones turn back in order to permit refueling.

There is no bad weather approach as such for the Flying Arrows. If calls up an low or island, as they often are in Europe, Topp will navigate to go along. "We'll give a hole for a loop if we can," he says. "People like to see a loop when everyone else is just doing rolls." When held in a really low altitude, the crew decide on one of the two ways to do it. Arrows, as far as possible, fly more varied since there possible with a four-drop team.

"If there's one Flying at all, we can usually do something," Topp says.

Weather Flexibility

He believes firmly in keeping the team's bad weather approach as flexible as possible. Even a check flight a few minutes before the performance has place would be rapidly defining whether the team leader prefers not.

The fact that there is no precise lead airplane may be an advantage as it was in Norway last summer. When the team took off for its performance at Oslo, the forecast was for a poor, possibly non-existent, flying day. Working quickly, the Flying Arrows found five land sites. They were able to run through them complete show by taking advantage of this although it had appeared at first that even a roll might be difficult.

The Flying Arrows have found that the major complication resulting from the addition of a fifth aircraft in the formation is that one pilot always is flying in someone other than the lead's assigned wing lead and making precision maneuvers more difficult.

Availability of power also becomes a problem for the lead team. As additional fuel is needed from their tanks, the need for more turns limits the available fuel air increases the complexity of the performance.

"It can't get fast aircraft, you should use them to produce shapes that are effective even though they may be complicated to fly," Topp said.

Nose Ship History

The nose ship formation which opened at Farnborough was introduced for two reasons. Since it was a British show, the Flying Arrows wanted to do something with an extra touch of the spectators they also wanted to bring more of the squadron into the act to emphasize that they were an open team and not just a band.

The pattern was formed by the original team in its lead ship. The original team, a second flight from a standard formation, had been joined with the leader of the first flight forming the Flying Arrows.

"The main black flight did a straightforward loop and then a soft before the formation split up for the regular fly-over performance."

This nose ship formation was adopted at a few more British shows in 1970 but Spain Ltd. Topp doesn't plan to make it to one of the international flying displays. For one thing, he concedes it would be an imposition on the hosts who usually pay him expenses. For another, it almost certainly would be impossible to get the team from Spain sponsored due to a severe cost to put nine ships into the air and to take them there. To provide his aircraft at a foreign show, Topp takes seven. At Farnborough, it will necessary to keep 12 aircraft at the nearby Oldham base to put nine in the air each day.

At British shows when much of the squadrons home base is North Wales, the team leader is trying with the idea of a performance which would start with a rough start, adding out at a time until in after 12 would be performing formation acrobatics. But that

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in which Topp will see about 1975 planes.

This advance points up the competitive spirit which has developed between the European and American teams in the last year. Many teams won't allow their planes much during the season but the end of the race may find them seeking new ideas from their next year's partners. Since the number of things that can be done is limited, it's not easy to be different.

At the 1957 Milan show, for example, five of the six teams appearing were using a basic four-spar formation and these five four were flying the same assault, the F-105 Sabre. Thus the breakthrough "guaranteed" in this year's Flying Angels with the four-motorled Fiat G.91.

Topp expects at least one more team from the Italian, to adopt the fighter formation next year. In sum, it is Italy's desire to pick up the Italian formula racing leading which proved such a crowd-pleaser at the Paris show.

Show Planning

Careful advance planning goes into the 10 days appearance of the Flying Angels at an international air show, says Leo Topp, manager of a racing team which has the responsibility of getting the team to the site. He starts it through a chain of reserves approach and second position aircraft, aircraft, side-loopers and so on other latter that can have an effect on plane and performance. Particular attention is paid to landmarks in the area and to wind speed calculations. At one location, for instance, Topp found that a slight hill would block part of the team's usual demonstration from the crowd. So a change was made in the lower altitude flying pattern.

He also tries to determine what other teams will appear since the results of the competition can determine which planes he brings with him. Meanwhile, the manager effects checks on availability of local supplies and determines what the team will need.

After Topp returns to the team's home base at North Wold, practice sessions are laid out in the light of what has been learned. He has checked for instance, on only one day the sun will be at the top of the day, thus enabling to appear. Practice sessions are then set up with the sun in that position. The team makes at least two practice flights a day in the week preceding the competition.

Two days before the show, the team flies to the site, taking along two aircraft, aircraft and pilot. If adverse conditions are drastically from those in which the Flying Angels have been practicing, Topp may call for a full

rehearsal the teams stay overnight, re-hanging to reuse the next day. This gives the team a chance to compare notes with the other teams in the show ("a sort of exchange") in the RAF leader calls as well as an opportunity to enjoy some of the local hospitality.

Rigorous schedules necessitate personnel from the ground crews of the Flying Angels. For as many as performance, the team takes 21 or 24 men in its ground crew, with RAF Transport Command providing the aircraft to fly them. For a performance in the United Kingdom, a dozen key ground crewmen are considered essential. A commentator, who usually is not

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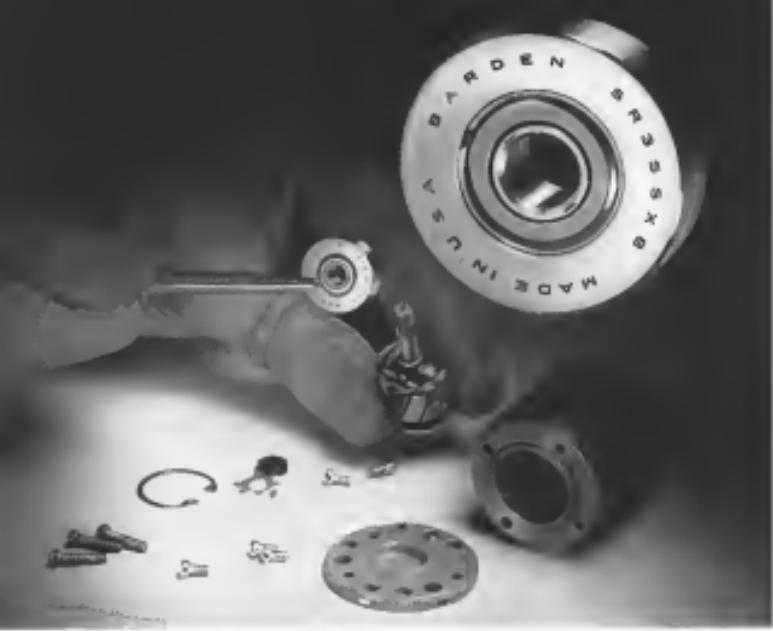
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a strong member of the Army roster but a pause occurs in his commanding ability as he tries to fit flightless spending down.

Team members are pulled from among the pilots serving a annual 23 month tour of duty with the squadron. New pilots are watched for promotion opportunities and given a chance to try out for the Flying Arrows within six to seven months after joining the squadrons. But there's a pause to it than that.

Most of the squadron can fly for combat sorties, Topp says, but not all of them have the personality for combat flying. It takes a man with a can-do personality to go to a log or show, engage in competition with other teams and stand up under the stress and strain he sees.

The team leader sits in the "big stick" position.

He's an active player on the stage as a competitor with selling whatever information helps him win.

After a month's living with the team the new men can get in shape to fit at one of the smaller air shows in Britain. That is, when Topp can tell whether he is more interested. If so, he goes on the road of the Flying Arrows. Ten pilots are now in the roster.

In 1957, there was one more team leader; in 1958, there will be two. Team members shift around quite a bit in the various slots and reach a standard where Topp says it is difficult to tell who is flying what position.

Topp rarely relinquishes about it. "It's a tough command," he says. "We'd sell off the team if we could if we just fit it in an advanced form of squadron training."

Although the team participation in some outside public relations events faces a none of the problems when it accompanies the appearance of an American team-partly because its dual role as part of an operational unit doesn't limit much room for it and partly because the RAF follows the tradition soft type of British sites meeting. Looking over the friends' shoulders, the Flying Arrows have a connection with a record 30 or more of the U.S. Navy's Blue Angels (Adm. Noy, 15 p. 77). Supt. Ldr. Topp commented, "That's pretty high-powered. I don't see how they do it though."

During the past year, the Flying Arrows took part in more than 100 air shows, half of them in foreign countries. That number is expected to increase in 1959. Like the other teams the RAF unit is using the off-season to work on its next year's show. The Sept. 17 Battle of Britain anniversary—during which the team flies from bases at different sites in one day, an addition to sailing has been flights across the far-flung appearance of the Flying Arrows until about April 1.

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Dear Park, N. Y.—Fairchild Engine & Airplane Corp.'s Engine Division committed to future of small jet turbines of less than 5,000 lb thrust was underscored in its completion of a \$21 million small turbogas development facility here.

Fairchild is certain that a need for lightweight small turbogas exists and will grow. The division points out that not only is there the looming commercial field with executive transports such as Lockheed's Jetstar (AW, Sept. 23, p. 29), but that in an intercontinental ballistic missile field war-with its own nuclear "time bombs" or subsequent nuclear fallout—there would be tactical and logistic need for small jet vehicles.

Starting with high thrust-to-weight ratio small jets would begin with development, continue through production and become even more pronounced in operation and maintenance, according to Louis W. Davis, assistant to the vice president in charge of Fairchild's Engine Division.

More Than ICBMs

In general Fairchild seems to agree with other segments of industry that current programs must not be allowed to cause the United States to end up with a stalemate of ICBMs and nothing else.

Actually more turbogas experts contacted recently in Aviation Week in government, universities and industry believe the country has a long way to go before exhausting the possibilities of air-breathing engines.

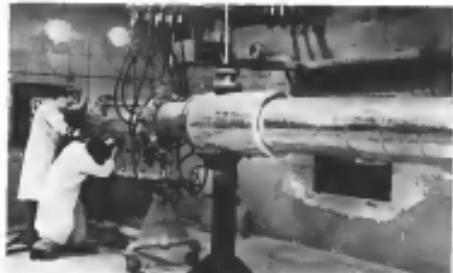
But here Fairchild's 2,800 lb thrust T-31 will fare against the competition offered by General Electric's J85 of similar size and power in a matter of crucial importance to Fairchild. Observers in the field do not appear to believe it is likely the best engine will be put into production. The engine which will be the first military application—such as the Northrop T-38 supersonic trainer—will then continue to lead the field, according to those observers (see p. 18).

J83 Glances

Close-up of J83 mode Fairchild's altitude chamber indicates that it is roughly a 15 ft diameter and four-turbogas. Those records which have been made by Fairchild engineers can be measured from it is a single spool engine with roughly a half dozen compression stages, no variable geometry, statics and possibly not even variable inlet guide vanes when the aircraft version. Performance will be slanted toward high speed Mach 2.5 flight where static fuel consumption (fuel to be 38.99) will be offset



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But, wouldn't there be something missing in the complete man-made Man—something very important?

"Yes," said the scientist. "A soul."

by other factors and it ought to have at least an 8.1 dry thrust-to-weight ratio.

Fairchild Engine Division has been able to increase output of its J58 program in its advanced development to offer customers which lost the J58 and J58A in J73 engine racing and turbine subcontracting. At the end of 1957, the division's backlog was \$20 million of which \$5.5 million was for J44 production and the rest mostly for continued development of the J58, said Gregg Chapple, division general manager. At the end of Dec. 31, the backlog jumped to more than double \$20 million because of the unusual nature of defense spending, Chapple said.

Hiring Intensified

Fairchild was showing continued interest in hiring engineers during the last three months following the contract let out a possible reduction of the strength of its small engine program.

For one thing, Fairchild has undertaken a considerable program of research, as basic as might be found in a large university.

The division's new laboratory, headed by Dr. Robert Gross, associate with Howard Sherry, is equipped with a 12,000-hp supersonic wind-tunnel stand said to be the first of its kind in existence.

Combustion Study

Present research on high speed combustion is the turning under power and part from the USAF and the State part Remington could lead to such propulsion development as the standing combustion wave 'cavjet' which has been studied at the University of Michigan.

A 40 ft. shock tunnel is to be installed shortly in the laboratory.

Fairchild's broad new small-turbine development facilities are especially inspiring when contrasted to the division's 2,500 square work floor and \$20-30 million present annual volume, see Seeler. In fact, generally, the small (probably less than 5,000 lb. thrust) turbines and — perhaps — turboprops which Fairchild hopes to concentrate on, the facilities are compact and orderly.

Air Compressors

At the facility is supplied by two Clark vertical reciprocating compressors by a 32,000 hp synchronous electric motor. The advantages of concentrating on small jobs are evident. Fairchild has been able to enter extremely variable size blast furnace blowers rather than having to enter somewhat specially designed equipment. Also, Fairchild's electrical power loads are so low that they can operate full power day and night.

The two compressor supply air pres-

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Here's a new pulling head and rivet combination that saves time and reduces cost in aircraft blind riveting.

New all-Cherry 600-500-669* rivets have the grip length clearly stamped on the pulling hook of the sleeve. The new size and indicator on Cherry 1E-60 and 2E-60 pulling heads gives the operator a sure match for perfect installation.

These precisely controlled stroke pulling heads can be used to install rivets with 68 mm lengths. Only a simple adjustment is required.

*Patents issued and pending.

The addition of this combination to the Cherry line of rivets and tools is another typical example of Cherry's constant improvement of fastening methods used in the production of aircraft and missiles. Is the goal of Cherry Research and Development.

For information on this new pulling head and rivet combination, send for Technical Service Bulletin No. 24 and No. 35. Write to Townsend Company, Cherry Rivet Division, P. O. Box 2157-N, Santa Ana, California.

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In Canada: Precision & Bullet Manufacturing Company, Union Gasoline, Ontario

up to 110 psi connected in series with up to 150 psi A/C, connected or parallel. Connected push/pull they can supply up to 50 psi and therefore much exhaust at a 7.5 pressure ratio. Braught speaking it would seem that the engine is adequate for developing engines of up to 5,800 lb. thrust which would perform at Mach 3 and 70,000 ft. altitude.

The air supply piping from the power house to the turbine engine is developed building and to the base aircraft building. In the base aircraft laboratories the air can be taken off at the main building and various sites as already shown two compressor test stands a combustion chamber facility and a turbine test rig. An auxiliary fuel facility is now under construction but a Lockheed spokesman said that it is unlikely that any swept turbines will be added.

Altitude Chamber

The altitude chamber for complete engine testing is approximately 30 ft diameter, 20 ft. long and is designed to simulate atmospheric pressures up to 50 psi (equivalent to 75,000 ft.) and can stand up to 100,000 psi. During altitude tests Lockheed says it will be able to the 150 acre site to cool the engine as fast as before it enters the exhausting compressor.

Of the two compressor test facilities one is used for single or two stage compressor validation. This installation can supply up to 1,750 hp at 20,000 rpm, and discharge pressures down to 5 in. mercury vacuum. The other compressor facility can supply up to 4,000 hp at 15,000 rpm, the agency says. Last, pressure testing of the aircraft engine of Mach 2 plus supersonic flight or altitude stage operation, the speeds can be approached with care as, The stands are sufficient for 100,000 compressor at simulated flight speeds in excess of Mach 2.5 and at altitudes in excess of 70,000 ft. Mach 1 and.

Pressure Levels

The combustion chamber test in altitude can operate at pressure levels of 15 psi maximum absolute to 150 psi with a maximum temperature of 1,500° F. At temperatures of high performance engines it is equipped with a preheater to simulate compressor bypassing and a fuel cooling system for cold start ing tests.

The turbine test stand can absorb 5,000 lb. at speeds up to 20,000 rpm and while actually burning fuel to support the test conditions up to approx. nearly 1,700° F. Turbine performance tests involve those of the compressor stand. Lockheed said.

Data recording, recording and con-

trol appear to follow modern semi-automatic procedure. Pressures for example, are recorded on transducers and read on a panel of IBM 1400 computers. Lockheed has developed an automatic probe swiveling and tracking system. Hot wire anemometers and ultrasonic were also mentioned.

Lockheed Chief Engineer S. V. Gingrey told Aviation Week how the company works to keep both stage-by-stage through compression testing in step, leaving its rotation and then testing the next stage by punishing the cascade which came from the first stage. In this way engineers make sure that each stage is done in full phase of the work, and can isolate weaknesses between the stages.

To provide training, Lockheed operates following a policy of offering young engineers internships such as graduate-level engineer courses or to apprenticeships. For example one engineer has prepared excellent work and teaching design of compression. Another engineer is doing a similar job on the basis. These courses are held during plant working hours. Lockheed also offers an cooperative engineering program where potential engineers who otherwise might not be able to afford college can take a degree in five years by alternating between some college in the plan at University of Denver.

Japanese May Build 42 P2V Neptunes

Tokyo—United States Navy and Japanese defense officials have reached a basic agreement on the production in Japan of 42 P2V aircraft. A formal statement if it is signed will be agreed by the end of March.

Under the tentative plan, Kawasaki Aircraft will turn out the planes at the rate of one per month from October 1964, to March 1967. Cost is roughly estimated at \$75 million, to be paid by Japan, the U.S.

The Japanese hope to start preparing for production next April, if a formal agreement can be reached by then.

Japan Using Missiles To Gather Jet Data

Tokushin-Komatsu Aircraft has recently built seven missiles manufactured on a trial basis at the company's Gifu plant to obtain data for the design of supersonic aircraft.

In one of experiments at the foot of Mount Fuji, the test missiles were shot at an altitude of 16,000 ft. at a maximum speed of Mach 1. Missiles are eight feet in length, six inches in diameter, have a mass weight of 110 lbs. and use solid fuel.



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At each step in the process, the guiding hand of the Cherry Research and Development Department is in control. For the engineer in this department devote their time exclusively to the development and production of better aircraft fasteners.

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military efficient fastening. In addition, they are supplied in the volume needed to hold production lines moving on schedule. The Santa Ana plant has the highest rated capacity in the world.

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For information on how Cherry fasteners and the tools for installing them can help improve your fastening efficiency, write to Townsend Company, Cherry Rivet Division, P. O. Box 2157-N, Santa Ana, California.

*Controlled under U.S. Patent 3,171,411, 3,197,310, 3,199,446, 3,199,459 and 3,200,446.

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LEAR



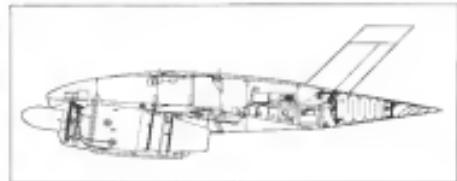
Ryan Develops Jet VTOL Display

SAN DIEGO—Development of an all-weather cockpit display that gives jet VTOL pilots information for transition from horizontal to vertical flight is under way at Ryan Aeromarine Co. under USAF contract.

Display, which provides the required information at the pilot level of 490 ft above ground, also meets requirements for aircraft display requirements.

FA accomplished developmental work. Ryan conducted a simulator study to prove Guidance Electronic Differential Analog (GEDA) and two Processor Analog Computer Electronic (PACE) computers, with associated servos, could be computerized to duplicate aircraft movements and responses.

Ryan photographs will be presented to contractors presently under way on a cockpit display employing test results, which will be shown to Wright Air Development Center officials.



How Firebee Is Arranged Internally

Cathode drawing of the Ryan Firebee target drone shows prescribed location well forward, exhausting under the fuselage. Fuel tanks are short and tilted slightly off the centerline. Guidance package is located in front of the fuel tanks and the recovery parachute is located at the tail cone.

AVIONICS



FRENCH-DEVELOPED diversity radar employs three transmitters, each operating at a slightly different frequency, to provide greater effective range and reduce susceptibility to enemy jamming. New radar will be evaluated soon by the Air Force Cambridge Research Center.

Three-Frequency Radar Has More Range

By Philip J. Klass

Belford, N.J.—French radar experts are developing a technique that reportedly increases effective range by as much as 15% while the radar becomes less vulnerable to jamming. The system, which gives greater speed and reliability, will be evaluated shortly by Air Force Cambridge Research Center.

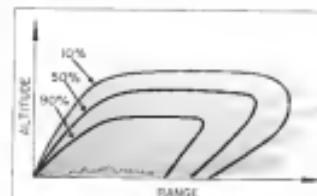
New radar technique is called "frequency diversity." It employs two, three or more radar transmitters and receivers, each operating at a slightly different frequency but sharing a common antenna and video display. The diversity techniques have long

been employed in radio communications and now are being applied in U.S. radar developments.

French radar was developed

and built by Compagnie Générale de Télégraphie sans Fil, better known as CGT, a telephone equipment manufacturer. Headquartered in Paris, CGT is owned by the French state-owned telephone company, a major shareholder which permits each to be connected to the other in sequence.

Normal radar cycle might consist of a two microsecond pulse transmission from "A," a one microsecond interval followed by a two microsecond pulse from "B," followed by another one microsecond interval and then a two microsecond pulse from "C." The cycle



CONVENTIONAL single-frequency radar coverage is not solid but consists of alternate range lobes and voids produced by pointed reflections. Typical 10%, 50% and 90% detection profiles shown.



DIVERSITY radar transmission on a second frequency produces drift in elevation position of lobes obtained which partially fills in the voids in coverage of a conventional radar.



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Dr. Nyquist is a pioneer in advanced areas of electronics research such as Information Theory and circuit noise, and is involved with nearly 100 projects in the field of communications. He is now continuing his exceptional scientific ability to develop a work as a for research electronic systems. Men like Dr. Nyquist are typical of Stavid's outstanding scientists and engineers who are working on advanced concepts... years ahead of actual systems development.

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AIRPARTS DIVISION

JERVIS CORPORATION
Grandville, Michigan

antenna in the evaluate tests.

The French have developed several other design resonators which are applicable both to the flat-panel radar and conventional types.

- **Fourier's supersonic**, a coherent type of moving target indicator (MTI) which employs a narrow tube instead of conventional dish to steer the echo signal and compare it with pulse-quiet echo to determine which signal action is from moving targets. French first claim. French technique has several advantages according to CST, including simplicity of adjustment, improved stability, and the ability to accommodate nearly a pulse repetition rate. The CST fourier echo power can be used with any radar equipped with stabilized local oscillator that can be adjusted to various radar intermediate frequencies. The unit was so equipped, an auxiliary stabilized oscillator can be provided.

- **Lidaroscene supersonic**, said to "possess electronic" window noise reduction, angular velocity detection, low level, providing extremely high contrast display on radar scope. The CST lidaroscene supersonic employs a horn-grid type storage tube for conversion of successive video signals passing onto the scope cathode. These signals which are decreasing at the same rate as the radar's pulse repetition rate



Display Range 4,000 Mi.

Radar display with maximum range of 4,000 mi. has been developed for MATL-Lorraine Laboratories' McMillan Hill missile defense radar (AVN Nov. 26, p. 14) by Alcatel-B. Do Mont Laboratories, Inc., under an Air Force subcontract. Functioning as a conventional B sonar in 16 m. altitude no false with 100 deg. azimuth coverage, and includes search range and azimuth search capacities. Radar tracks are color, trigger and systems position. Although pulse repetition frequency of the radar has not been released, it claims far exceeds that to obtain atmospheric range scale extension power it would be in the order of 30-35 pulses/sec.



This McMillan radome assembly was specified by both Capital Airlines and Vickers-Armstrongs!

In selecting a radome supplier for the famous "VINGOUNT" both Vickers and Capital sought a manufacturer with new major qualifications—long experience in radome design, development and production, and superior electrical testing facilities, for guaranteed performance.

They both specified McMillan.

In the assembly illustrated above, McMillan supplied a complete "kit" including the radome, micro wave absorber material (type "X") and locking plus the necessary hardware to affix them. McMillan made two radome designs—Honeycomb Sandwich for X band and Solid Laminate for C band. The unique hinge design of the mounting hardware affords easy maintenance and repair of the radar equipment.

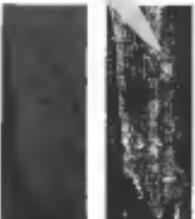
Airline manufacturers—commercial airline—private aircraft owner—each can take advantage of these unique major qualifications* offered by McMillan.

For your nearest McMillan Radome Assembly "Kit" dealer, see opposite page.

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Moscow?



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MANHATTAN

The photo at the left shows how Soviet P-38 fighters look when their radio equipment has been removed. At the right we see how they fit back in again. It's not like the engine compartment—But every radio operator has his own idea.

Anytime ANYWHERE can be seen by INFLIGHT magazine. Whether for maintenance, technical assistance or any city operations, no concession is just as informative when made under cover of night or through the clouds. And it's just as effective as located there, around enemy territory.

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For specific information on infrared cameras and other systems or to be listed in military and industrial operations, write for the IR Booklet.



for laboratory tests proved to be within 0.01% of its ideal operating frequency. The circuit includes a switch positioner, which positions the tube. R. D. Spurr estimates that tubes with stand shock greater than 100Gc at unit shock detonation.

Final 1958 Avionics Income—Dewitt electronics capabilities for the quarter of fiscal 1958 were \$926 million, nearly 30% above the equivalent quarter in 1957. Total sales in fiscal 1958 were up 20% over the estimated \$1.37 billion sales for defense departments in fourth quarter of fiscal 1957, ended June 30.

New Skin-Sun TV—General Electric reports development of new skin-sun TV technique which permits maximum use of one stage color TV set over conventional techniques. Input image is increased, temperature compensated bias disk of balanced modulated signal is used.

OFFICE

FILTER CENTER

CLASSIFIED

Broadband Jamming Antenna—Countermeasures jamming antenna, having 30 dB bandwidth, capable of jamming at low or high rates of speed and with facility for beam tilting through a 180 deg. angle, is a result of a passive technique, has been developed by Pilkington & Barnes, Newham, Man. Five plug-in racks allow element power wide band operation.

Converter for 42-Volt Aircraft—Twin saturable converter Type 51HG-1 which provides two of standard 27.5 V. aircraft ac power equipment in either series with 12.5 V. power transformation available from Collins Radio Co. The 7.1 kVA device provides 10 amp continuous rating, 15 amp for short duration, draws, however, approximately 9.1 x 12 x 14 in.

Rugged Klystron—Klystron tube, which was installed in missile that was intentionally exploded during final phase of its weapons test flight, fell 11 km into the sea and was later salvaged from ocean floor and returned

■**7' m. or Pulse-Modulated Frequency Standard**—"Belt and road," hand battery source, developed by Bell Telephone Laboratories, was demonstrated at recent Eastern Joint Conference, Cambridge. The experimental device is able to distinguish between different



signals by sensing how many and which of seven metal radial sectors are intersected by the internal sectors on the face plate using a metal "pencil" which is electrically connected to the device. Multiple lights give one of a series of numbers corresponding to number of sectors to enable operator to check its operation.

New Airborne Ultrasonic Program—Galco Industries has set up program to investigate airborne applications of ultrasonics, welding, fog and smoke dispersal. Program is headed by Robert M. Gal, Galco Research, Inc., recently brought to Galco by Max A. Auer, who holds number of patents in ultrasonics.

Signed on Detrot Line—General Electric Light Mfg. Electronics Equipment Department, Douglas, reported receipt of a \$5 million Air Force contract for production of MA-5 fire control system for Republic F-105. System includes solid-state lighting, fire bomb computer and is designed to handle all methods of attack, including ground missiles and bombs. Radion Audio reports an order for 600 C-band airborne radars from



Tuning Fork Timer

Transistorized electronic frequency standards have been developed for accurate resonance timing systems in Bunker Ramo Corp.'s Instrument Division. Circuits are integrated in one or more cases over a period of months. Primary source of frequency is a thermistor, temperature compensated bias disk of balanced modulated signal and oscillator

Bristol West Indian Aircraft Ltd. in addition to its Vickers Viscounts has an order. Company also reports that Swedish Navy has specified Bristol EPA-70 ultramodern electronic fighters for its initial order of long range EL-11A fighters which will be used in air-to-air combat work.

Mobile Telemetry Survey-Accuracy System, Inc., Glendale, Calif., is seeking sources of extra field of use in mobile industry under Army Signal Corps contract to provide hand held microwave standardization of telemeasuring scale, capacitors and feedlines. Survey includes such things as types of circuits, frequency allocations, types of modulation, bandwidth requirements of transmitters etc.

USAF Control Display System—An Army philosophy and concept for integrated cockpit displays and controls will be subject of symposium to be



Canadian Navigator

Delayed action cameras developed by Canadian Marconi Co., Montreal, are shown installed in DC-1 aircraft by Sparrow Air Service Ltd., Ottawa, which operates air survey service. Camera, designed for bush aerial surveys, was modified externally on DC-1 belly and housed in plastic enclosure to simplify field installation for Sparrow evaluation in survey work.

held at Elgin Parkhouse Hotel, Feb. 13-14 for industry and government representatives. Persons wishing to present papers, or obtain registration information should wire to John H. Keenan, Box 942, Elgin, Ill.

Monopulse for E-105—North American Aviation's Autopilot Division has received contract from Republic Aviation for a "monopulse monopulse radar" for installation in an improved version of the E-105, North American report.

RCA Radar for Convair-Sid Est. French aircraft manufacturer, has ordered 34 ANQV-10 radars from Radio Corp. of America for installation in Convair's newest jet-powered long-haul for Air France and SAS airlines. RCA also reports that Trans-Canada Air Lines has exercised option to buy 34 ANQV-10s.

Ergo-Thot building—See page 111 of Dec. 16 issue with comments in the background was Clinton Process Products Company's new 35,000 sq. ft. facility at Colorado Springs and not the new Western office in Los Angeles as reported. New plant will assist Clinton's manufacturing capacity for production of avionics and other electromechanical devices for avionic applications.



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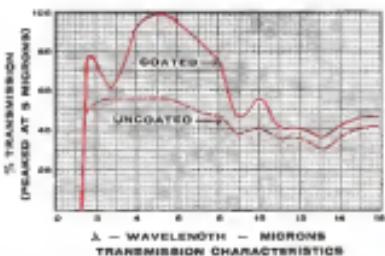


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Transmission efficiency (goated) ... Over 90% at any
selected wavelength
Index of refraction ... 3.4 at 1.0 micron
using 3d without anomalous and open
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TEMPERATURE CHARACTERISTICS

Losses in efficiency ... usually unchanged from -100 to
+100°C
Thermal shock resistance ... withstands -100 to +100°C
less than 1 sec.
Coefficient of expansion (STO) ... 0.25 x 10⁻⁶/°C
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BASIC CHARACTERISTICS

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TURBULESS cooling computer for interceptor fire control system can handle many weapons



PLUG-IN sub-assemblies and plug-in circuits provide flexibility, easy maintenance

Computer Controls Weapons Firing

Bellcomm—Analog type, integrated fire control computer which can provide precise fire lead solutions during air-to-air tests for gear radars as well as surface-to-surface has been developed by Wright Electric's Air Arm Division.

New computer is designed as possible replacement for Whittlehouse Avco 3B computer now in use in nose of Navy's F-4D in order to add air-to-air missile weapons and other new capabilities. In

order to fit the increased capability into the same size enclosed frame, the emphasis has substituted transistors and magnetic amplifiers recognized for previously used vacuum tubes and has minimized other static elements. Computer uses 255 silicon transistors, 216 silicon diodes and 12 magnetic amplifiers.

Plugs facilitate quick power connections to be quickly changed in secon-

ds. Different types of weapons for various tactical flexibility. Many of computing functions are performed by eight standard types of plug-in cards. These plug-in cards and their plug-in sub-modules together with built-in test circuitry are expected to simplify maintenance and troubleshooting.

Computer is designed to generate over temperature range of -40°C to 55°C. Power consumption is only 120 w., approximately 60% less than equivalent vacuum tube model.

NEW AVIONIC PRODUCTS

Components & Devices

■ Transistor, Type 2N463, positive biased lateral PNP junction transistor. Applications include compensating aircraft陀螺仪, balance beam amplifier and phase detector. Maximum collector (or current) voltage is 40 v., maximum collector (or emitter) current is 200 mA. Typified d.c. current amplification factor is 45, β_{dc} at 1000 volts. Alpha cutoff frequency is 0.3 arc minutes. Philco Corp., Philadelphia, Pa.

■ Magnetic shaft encoder, Type SR-60 are torsionless and designed to operate from 0 to 90 to 500 Hz. Signal to noise ratios are greater than 15 to 1 with voltage drops of 0.5 v. seems drive speeds. They can be used as drivers with low current. One voltage source will supply both driver and data register. Watt output is 0.5 v. ± 1 v. logic is equipped with wave-pulse bias for tube sockets or printed circuit mounting. Other ratings are available. Epsco Inc., 588 Commonwealth Ave., Boston, Mass.

■ Microsyn signal generator or integrator unit, compensated to produce a square wave proportional to angular displacement. Unit is a circular differential transformer with a variable bridge arrangement to compensate for non-uniformities introduced by electrical and mechanical characteristics. Units are available with 0.5% linearity and allow



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able angular rotation up to ±20 deg.
Striations are to 8 v. cdeg. with a sag
and no more than 0.01 deg. max. at 14 O.D. by 8.4 in. in length.
Lether Manufacturing Co., 1123
Vernon Ave., North Hollywood, Calif.

* **Microminiature relay, Type SC,** in the size of a conventional crystal case. The SC is a dual coil assembly of switching 2 amp. at 90 vac. or 1 amp. at 115 vac. sensitive, operating on an
approximately 6 milliamper contact current at 13 g. striking a permanent



magnet to obtain operation under
loads of 180 g. and vibrations of 10 g.
to 1,000 cps without contact openings.
Unit measures about 0.50 x 0.38 x
0.18 in. and weighs 17.5 g. Farnets &
Braunfeld, Inc., Princeton, Indiana.

* **Slide rule designed so rapidly an**
increasingly complex system older
systems often fails. In addition, given
less storage room to some ratio and
more other problems over the frequency
range from 1,000 to 10,000 cps. In
the design of the slide rule, the width of
the dimension being width, center, border,
and other factors relating both to the



and single integrated multiple elements
have. Further information available
from Microtek Communications and
Electronics Inc., Microscopic and Industrial
Control Department, Co. Commerce
Corporate Division, 401 Ninth Street
Street, Philadelphia 5, Penn.

* **Low voltage inductor, Type HT-1,**
features insulation resistance of 10¹⁰
ohms at 25°C, capacitive without shorting
from -55 to +200°C. Capacitance is
less than 0.001 to 0.1 pfd. soft
up ratings are up to 10 v. d.c. with

tolerance as low as ±1%. Bala Cynwyd
Division, Bala Research Laboratories,
Inc., 19 Cedar Plaza, New York,
N.Y.

* **Line noise paper chart, Type AIA**
1013, measures noise figure in the
frequency range from 300 to 4,000
cps. According to the manufacturer,
typical noise figures of 3 to 5.5 db. can
be obtained which are in comparison
with a 50 ohm 11.1 db. noise source.



Inductor. Crystal requires no dc. bias
and after radiating line where reflected
rf signal levels are limited to 150 mV
or less. Typical conversion loss and
noise temperature values are 4.8 db
and 10.5. Microsonic Associates, Inc.,
Burlington, Mass.

* **Pulse transponer, Series 70-5427**, is
available for high current ratings in
conducting lead, dry cell, and in high
speed digital recording applications.
Primary and secondary, as well as two
secondarys are close coupled to permit
use as a read/write circuit. Turn rate



of 1.25 can be modulated to much
higher frequencies without damage.
Circuit is built in high temperature
resistant Resistor Co. Ceramic
Corporation Division, 401 Ninth Street
Street, Philadelphia 5, Penn.

* **Dc. circuit "solid state," Type**
418EL, is designed to meet MIL-R
5575C and MIL-R-6180G. Relays can
handle the function of a "dc switch"
with those of a high current relay,
from one ampere at 15 v. dc. to
a 30 ampere/minute load. Unit
measures 1.6 x 1.6 x 2.6 in. Electro-
Mechanical Specialties Co., Inc., 1016
North Highland Ave., Los Angeles 35,
Calif.

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AT THE END of a day's counterinsurgency operation in the Sahara region of Algeria, H-34s are landed down the right. Aircraft often spend from three to five days in the field. Note the dunes lying about. Frenchmen in background are performing light maintenance.

Report From Algeria, Part II:

French Fight Helicopter Engine Trouble

By Robert E. Farnell

LA SÉNA, Algeria—Man repair of one engine among French Air Force eight missing millions of helicopter hours has been available. For operational use in the Algerian campaign at an early time.

Air officials figure that, had such care that only about half the Air Force's patrol helicopter strength has been available. For operational use in the Algerian campaign at an early time.

While the search and rescue helicopter unit of the 600 hr mark for Wright R-1300 in the Bell 47G, H-34 and the Wright R-1820 in the H-19, are 100% available. In the French Air Force has ever reached that mark. It is not uncommon for an engine to be pulled after 25 hr.

Obvious cause for this short-term difficulty is the French themselves and not in the state placed on the engines during combat missions. Some engineers often think that perhaps pilots could cut down that trouble by more careful throttle settings, but in the majority of cases engine overhauling must be invited. Nevertheless the short

time earlier operation and just back to France before it is damaged.

While Air Force officials are not now quite satisfied with the H-34 power plant, they still put their faith in the H-34 as the best heavy helicopter in Algeria. This means they will believe the Sikorsky helicopter is superior to the Verville 3121, which the French Army has. Also, of course, disagree since the French have avoided all no further evaluation trials on the two helicopters since the summer of 1954. The most recent recorded and probably well run was that.

Punishing Conditions

The French have been operating H-34s in combat since the summer of 1954. Missions have been carried out in more than regions as well as in the Sahara. Air Force has observed that the H-34 can take more punishment than the more famous has promised, and even more than the French had hoped for. Like the Army's 3121, most of the H-34's missions are commando carrying, over against a group of that H-34s

will be attached to an Army unit and will remain away from La Sénia for 30 flying hours. Drills, 90 and 100 hr inspection are now being polished in the H-34 in the field. French Air Force workshops even have parts capacity in the field, trying to get to use out in Algeria where no "A" frame was available.

Being close to the Moroccan border where anti-air traffic goes on sporadically, La Sénia's H-34s probably are more combat than do those stationed at Boufak in central Algeria.

Average monthly flight time on a La Sénia H-34 during 1957 was about 35 hr. Until September, when seven additional H-34s were added, La Sénia had with 12 H-34s.

Military Planes

The complete number of French planes another through October by La Sénia's 12.25 hr were follows:

- January—414 hr
- February—391 hr
- March—575 hr
- April—363 hr
- May—463 hr
- June—463 hr
- July—458 hr
- August—539 hr
- September—625 hr
- October—569 hr

La Sénia, newest French Air Force helicopter base, is located near mid-point between Oran and very far from the Moroccan border. Set up in November, 1956, La Sénia's helicopter strength was about equal to the Air Force's other helicopter base at Boufak, near Algiers.

The two helicopter wings are commanded by Lt Col. Servet of French Air Force Fifth Air Region, Algeria. Colonel Servet's two-pronged operations works closely under French Army



FRENCH AIR FORCE H-34 lands down on sand pit, preparing commandos to hop out for an operation in the Algiers northern region. Note helmeted air trooper in background.

requirements. Taken together, La Sénia and Boufak are presently operating 99 helicopters. Colonel Servet told Aviation Week recently that within its months another 10 Sikorsky H-34s and another 20 Sud Aviation Alouette will go into operation.

Operational Regions

In general, the Air Force is responsible for helicopter operations in Western Algeria while the Army handles the eastern half. The dividing line is the fourth degree of longitude, although this line also is crossed by both services during combat operations. In addition to combat wings of La Sénia and Boufak, the Air Force would like to establish a third wing in eastern Algeria.

The two helicopter wings are commanded by Lt Col. Servet of French Air Force Fifth Air Region, Algeria. Colonel Servet's two-pronged operations works closely under French Army



COMMANDERS of helicopter transport forces are available in every operation, available by radio. Commander often makes first pass over drop zone before H-34s discharge troops.

gren, near Constantine, but "service public" patrols will keep the Air Force out of the area.

Helicopter Wing EH3 at La Sénia is made up of four squadrons. Two operate H-34s (7C-2 each), one H-34 and one H-19, the latter powered by 1,500 hr. Wright R-1300 engine and finally there is one "lower" squadron of 29 Sikorsky H-34s. Air Force Alouettes are operated out of Boufak.

Wing EH3 is commanded by 49-yr old Col. Georges Boucet. Col. Boucet, like most French service officers in Algeria, has been fighting a war somewhat like ours since 1939. Having an H-34 trained with similar liaison, light combat and medium guns, Col. Boucet puts in as many as 150 flying hours per month. He and his flying adjutant, Maj. Yves Sagot, as well as most of the 150 personnel at La Sénia, generally took a 7-14 day vacation during the winter months.

Long Hours

General personnel shot appears to log substantial work hours. Wing EH3 commanding officer Capt. René Marteau, has about 380 mechanics under his charge in 14th, when operations against rebel bands were frequent. Capt. Marteau's records show his men put in 40,000 hr or 25,000 gun runs. Gun crews usually serve four hours for ground patrols, although one hour of instruction for each type of helicopter pilot is also due.

While La Sénia is perhaps a bit inactive, the Air Force helicopter operations at Boufak is still in full swing. The Boufak base has undergone substantial changes since Aviation Week

ENGINEERING MATERIALS HANDBOOK

Engineering Materials Handbook (McGraw-Hill, New York) is the most comprehensive handbook of engineering materials ever published. It contains over 10,000 entries on all types of engineering materials, including metals, nonmetals, composites, polymers, ceramics, semiconductors, glasses, and alloys. It also includes tables of properties of the important classes of materials, such as mechanical, electrical, thermal, optical, magnetic, and physical properties. This handbook is an essential reference for engineers, scientists, and technicians in all fields of engineering and technology.



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French Air Force Helicopter Availability in Algeria*

(Top figure shows availability; bottom shows potential)

Bell 47G-2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	
										On	Off
Bell 47G-2	38	38	38	38	38	38	38	38	38	348	334
Sierra 3	38	34	34	28	34	34	34	33	30	319	319
Boeing Alouette											
Huey	7	4	4	3	7	7	6	7	7	83	83
Sierra	11	9	11	18	11	10	16	18	18	116	116
Sikorsky H-19	9	8	9	8	11	14	12	12	9	74	83
	10	10	12	16	15	21	19	17	16	146	146
Sikorsky H-34	12	9	7	3	11	12	12	12	14	143	135
	23	20	27	26	29	39	37	36	37	327	327

*Information for La Sénia and Boufarik of French Air Forces in Algeria through October, 1957.

first visited the operation a year ago. Then the base was just being built and things were rather primitive. Today, modern barracks, hangars, bonding, loading and parking spaces are the rule. Commanded by Mr. René Stein, E137 at Boufarik has 85 pilots and 300 mechanics.

There are three squadrons at Boufarik. One has 16 Alouettes, four Bell 47s, two Sikorsky H-19s and the third 19 H-34s. Although most of these month-old Alouettes are in a complete flying condition and probably in a combat-ready state, the first four delivered to the Air Force in Algeria and will be assigned to Boufarik.

With La Sénia's light helicopter requirements as fulfilled in the Bell, Boufarik has been chosen as the first Avrovia Alouette II helicopter test and service center in North Africa. The first Alouette II arrived in March. The five-place helicopter is powered by a Turbomeca Astazou II engine developing 590 hp at takeoff with continuous performance rating of 325 hp.

An interesting experience with the Alouette has been light antiaircraft. René Blédel gave some trouble at first, but now seems to be all right. The blades are not interchangeable, but if one is lost in the sea there is no difficulty in getting another. Turbines still are being pulled at 250-300 hr., though the French are planning to let them stay for 500 hr. Air Force records show the Alouette availability since its start operational last March has averaged 91%. This is lower than the 93% availability claimed by Avro at 500 hr., where 18 Alouettes are operated.

Flight command on the Alouette runs much on the recommendations of the engine speed governor, with adequate power limits which obviously need to prevent helicopter pitch oscillations. Some French pilots feel substantial improvements have been made in the

on occasions, this being saving arrangement is evidenced.

La Sénia light helicopter at the Alouette site is used on a variety of missions. But its most important task consists of surveillance and as a flying command post.

At Boufarik also has developed a pick-up truck with a platform of mounted machine gun. When mounted on a truck and loaded with a box of Boufarik mud in its rear, it can withstand the following operations fully intact.

A Nonstop transport take-off from Massawa-Melegat outside Algiers and back to the 15-mm. to Boufarik. During this time inter flights on the Alouette site are discontinued so that when the Nonstop lands at Boufarik the Alouette could land on its platform and go directly into the Nonstop. The Nonstop then flies the several hundred miles south of Boufarik to the site in the area where Boufarik had started its flight. The Nonstop then picks up the Nonstop, but about the way picking up the Nonstop and bringing them back into the airfield where the Nonstop, now loaded with supplies, flies back to Algiers. The Alouette, in its turn, then makes its own way back to Boufarik.

Before January, 1958, there will be three French helicopter flying in Algeria. From January, 1958 until the end of October the Air Force in Algeria established the following eight bases:

- Bell 47G-2—15-362 hr.
- Sikorsky H-19—15-454 hr.
- Sikorsky H-34—21-395 hr. beginning mid-1958.
- Alouette—8,192 hr. beginning March, 1958.

During this period a total of 228,000 troops were transported, 6,551 wounded evacuated and 1,264 metric tons of cargo lifted.

BUSINESS FLYING



SOUTHWEST Aerospace's new business aircraft terminal is at left. Two buildings at right are hangars slated for April completion.

Southwest Opens Business Pilot Center

DALLAS—Opening of phase one \$200,000-plus business pilot terminal building face at Love Field last month launched completion of a major phase of Southwest Aerospace Co.'s \$4 million expansion program.

The new building will be operated on a round-the-clock basis with flight operations facilities including direct access to Comair flight control centers and Dallas radio. Uniform radio frequencies also include conference rooms where business men can hold sessions without leaving the airport, and a restaurant.

Twenty business aircraft currently are based at Love Field and is expected to grow to four large transports and service bays which will contain office facilities for business aircraft tenants. Faquin is co-owner of an 18-share company, says capable of taking planes up to Boeing 707 size.

New terminal building also contains offices of Southwest Vice President Wimberly Condit, Vice President James Lockhart, George Killis and Everett DeWitt, all of the engineering staff and Earl Webb and John Jack, of service sales.

Next phase of Southwest Aerospace's program includes construction of a 1,000-acre ft. distribution sales and service building behind the terminal and additional aircraft storage facilities. When these are completed Southwest will be able to handle 400 aircraft.



SOUTHWEST aerospace's new pilot center will be shown from outside (left) and inside (below). Terminal is part of Southwest's \$4 million expansion program.



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1983 CALIFORNIA HIGHWAYS



ASP, second stage, being sent to Niles Brothers.

INSTANT-MAP (below) is scaled to 100' increments.



Nike-Asp Gathers Solar Flare Data

Nike-Ajax research rocket reached an altitude of 805 m., believed to be a record for this type of two-stage research rocket. During Project Sandstone, an International Competition You actively devoted to solving safe solutions.

Koster was first by short waves an equal time nearby observations that told them about this place. Crows had only 60 sec. respiration warning. Mount Wilson Observatory, 70 m distant from the Sea Nodules, recorded sounding site, tracked the rocket both results and by radio teleferencing. Measurements at X rays during flight indicate that emission of low intensities produced in X rays, cause radio fiducial to 1.23 sec long.

NASA Aug rocket is 27 ft long and carries an instrument payload of 15 lb. The firing was conducted by the Cooper Development Corp., Minnesota, Calif.



COMET fuselages are rolled from fabrication shop to assembly hall, pick up assembled engine bay section and continue wing assembly.

Comet 4 Rollout Expected Next Month



HATFIELD plant (above) can hold 11 rugged aircraft. Below, controls are being assembled.



Long Life Predicted

De Havilland claims to have increased the overall stress levels that the fuselage, in the first program, should show a fatigue cycle life of 180,000 hr—equivalent to 60 yr of service in terms of the maximum life. Specimens tested already have demonstrated that even with a safety factor of five the safe fatigue life of the older fuselages thus far is three times.

The need to increase the fatigue life of the Comet has been met by increasing thicknesses of skin gage

AVIATION WEEK, January 13, 1964

PRODUCTION

thickness to reduce the overall stress levels.

* Avoiding sharp radii of contours to put local stress concentrations.

Most dramatic increases in the fatigue life of the aircraft relate to the wing where a switch was made to 248—a copper bearing light alloy in the lower outer boom and wing plan. Coupled with the use of molybdenum disulfide as a friction agent around the joints and bolts, the fatigue life of wing joints has been increased 90 times, from 100,000 gear reversals between 16 million cycles.

The new alloy, which de Havilland says has improved fatigue characteristics, imposes a slight weight penalty due to its lesser strength being slightly lower than the original zinc-bearing alloy.

Low Stress Levels

Design stress levels in the 19 gage skin now used on the fuselage have been so reduced that the structure should remain entirely free from the severe noise of fatigue cracks over a period six times its fatigue life. Evidence of this large safety factor means that should a crack be imposed by service



ROLLS-ROYCE RA.29 turbine engine is shown above being positioned in Comet's wing nacelle.



FINISHING touches are applied to the interior of a Comet. First Comet 4 is expected to be rolled out next month.



ALL Comets will have Rolls-Royce and nose elevators and ultimately thrust reverser, now approaching final development.

AVIATION WEEK, January 13, 1964

NEW AVIATION PRODUCTS



Small Actuator for Electra

Actuator that measures three inches long and weighs three-quarters of a pound is rated to open and close duct shutters to prevent increased air flow through a refrigerated unit or ground cooling of Lockheed Electra's cabin.

Costs \$100 for the actuator at 10,000 ft and it can supply up to 100-lb.-in. of torque at 100 rpm at 10,000 ft. Two stages of compound planetary gears, staged in a half inch deep can, permit two high gear ratios. Ratio can be modified to 9,000:1 if solar motor. Electra switches have been discontinued.



Lamp Ballast

Transistor lamp dimming circuit for aircraft lighting provides fixture-free continuous light control over lighting ratios in excess of 100 to 1, the manufacturer reports. Control requirement is 42 mA per lamp at 117 ± 10% cycles for full lamp output.

Dix-Box Products, Inc., 1133 Mission St., San Francisco, Calif.

Jet Blade Microscope

Turbine and compressor blade microscope is designed to allow checking out each blade's leading and trailing edges, but also of bonding of rada with blades. Image provided is a normal blade



and the actuator can still at full open switch, with voltage, withstanded applied without damage to the motor, it is stated. Motor is T-15's single phase, 600 cycle ac type, with integral start capacitor. Unit can be supplied with a 26:1 dc ratio.

Airframe Manufacturing Division, Division Corp., Los Angeles, Calif.

Accelerometer Sensors - .01G

Charting or electronic pendulum-type, 4-5/8 inch acceleration is designed to sense dynamic accelerations due to 0-10G from 25 cps to 50 kc, predicts a flat response between 50 cps and 60 kc.

Unit will accurately measure vibration accelerations and shock up to 1,000 Gs with damping adjusted by 200Gs steady state acceleration according to the manufacturer. Drive coil operates at -10° to +10°. Low inertia mass of the equipment makes it suitable for testing small lightweight components, the maker points out.

Consolidated Electronics Corp., 930 No. Sierra Madre Villa, Pasadena, Calif.



17-oz motor used in a pump-to-cool cooling package on the Boeing 707 jet transport.

Electrical specifications include standard aircraft ac power supply 430 cycle, 300V, 4-pole, 1-phase, maximum duty, 31,500 cps. Motors meet military specification.

Trintec Corp., 1009 E. Vermont Ave, Anaheim, Calif.

Pneumatic Jet Starter

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Engle Equipment Co., 411 So. Baseline St., Chicago 5, Ill.

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Pro-Flite Industries Corp., 30706 Gofield Ave., Paramount, Calif.

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allowance package rather than in a separate design. Ratings from 0.6 kva down to 125 kva, but larger requirements can be met, the manufacturer reports.

Turbo-Machinery Division, Armstrong General Corp., Azusa, Calif.

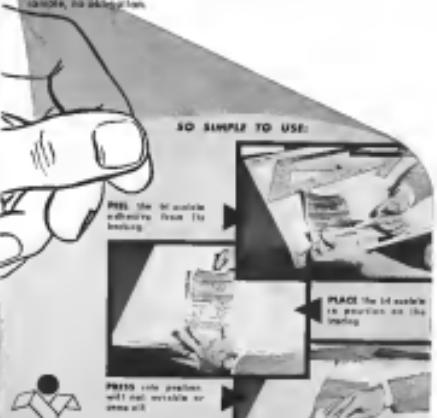
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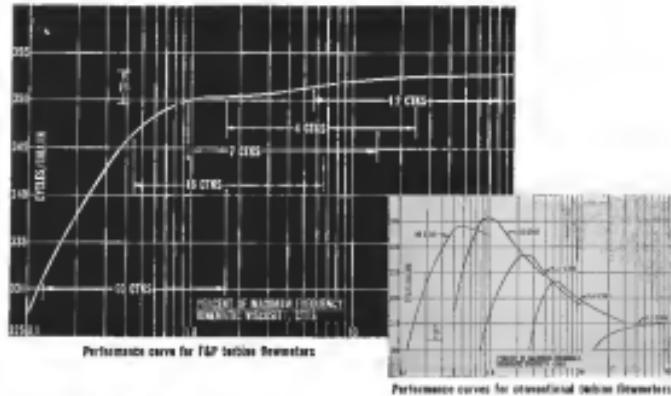
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Complete Process Instrumentation



signed to close off air flow with an airtight controlled air leak of 0.2 ± 0.01 lb./min. with a maximum pressure drop of 4.75 psig.

Pressure drops across the valve does not exceed 4.69 psig for an air flow of 2.7 lb./min. at a pressure of 17 psig and temperature from -50°F to 260°F. Actuation force is stated to be user selectable with an actuator air pressure of 60-92 psig.

Unit's length is 4 in., height is 2 in. and width is 3.62 in.

Propulsion Research Corp., 1960 Franklin Ave., South Mexico, Calif.



Fast Plastic Sealer

Plastic coating machine is designed to cover metal parts with lacquer, paint, stopple material or zinc epoxies, chlorinating, heat-dipping. Coating material is melted in an electrically heated, thermoelectrically controlled tank, a seven day program time clock control being included. Parts are hung on a conveyor for transfer into the tank.

Aerco Tools, Inc., 9130 Bellview Ave., Los Angeles 45, Calif.

Flight Data Plotter

Model 314 visual records plots graphs of 12 selected flight test variables at 15 times the speed of data



For nerves that
won't break down...

... specify **REVERSE TEFLON® CABLE**

Electric cables, the "nerves" of monitoring and testing systems in missiles, rockets and aircraft, are constantly being stressed by the steering heat around jet engines... the sub-zero cold of the stratosphere... immersion in fuels, chemicals or solvents. Reverse Teflon Cable meets these high service requirements... and those of computer and radar applications, too.

Reverse Teflon Cables are available with 1, 2, 3 or 4 teflon-insulated, silver plated, stranded copper conductors, rated for continuous operation from -90°C. to +210°C. Cables are shielded with silver plated copper to give 90% coverage. Jackets are optional — silicone treated glass braid, teflon, Kel-F®, vinyl, nylon, etc.

Conductor sizes 24 to 18 gauge in .008" (200 mils), .019" (160 mils) and .015" (140 mils) wall thicknesses. Tin and tin/lead alloy walls conductors meet applicable requirements of MIL-W-18807, Type II and III.

TECHNICAL SPECIFICATIONS — Single Gender Teflon Insulation

Stand By Voltage	1000 volts
Insulation Resistance	Greater than 10 ¹² megohms at 100°C.
Continuous Operating Range	-90°C. to +210°C. (1)
Dielectric Strength @ 1.0 kVDC	2.0 maximum
Power Rating @ 1.0 kVDC	Less than 0.0001 watt
Resistivity	Greater than 10 ¹² ohm-cm at 100°C.
Shedding	(see chart N° 10-197) 0-250°C for 10 hrs.
Absorbency (per MIL-C-24255)	Passes 20° at 100 psi, absorbency ends 30° at 100 psi
Milite Absorbency	6.0
Specific Gravity	3.0 average
Chemical and Solvent Resistance	Excellent

See Technical Information
bulletin 10-197 for
200° C. operating range
and other test data.

Write today
for Engineering
Bulletin 1965 describing
REVERSE TEFLON® CABLE.



REVERSE CORPORATION OF AMERICA

Wallingford, Connecticut

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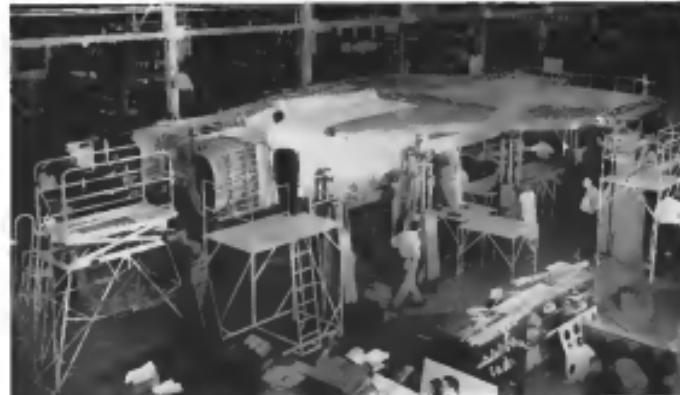
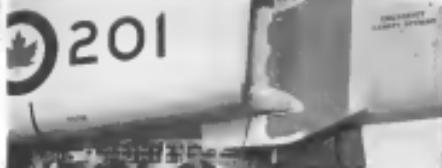
All view of the CF-105 shows the extreme thinness and blunt leading edges of the lifting and stabilizing surfaces. The first prototype has completed low speed test flights at Malton Airport, Toronto, and will undergo high speed tests today in low to three winds. During the high speed test trials Avro's chief test pilot, Jim Zenithowski, will take the aircraft up for its first flight but no date has been set. First live aircraft will be powered by Pratt & Whitney J75 engines, later ones by General Electric.

Avro's CF-105 Arrow, Nears First Flight

Fifth of CF-105 has started vibration testing. Glass panels around the cockpit are off flat. Avro's operators in a seat directly behind the pilot under an almost solid metal canopy. Very small windows on each side just off the engine intake give blow-by only views.



Rocket-powered first-flight model of the Arrow is readied for flight. Thirteen such models were built in Canada and the U.S. to supplement wind tunnel data. Solid fuel boosters lift nose after the model reaches speed; data is returned to the ground.



Large fuselage sections are joined to the center wing panel and aft fuselage. It is part of production testing which is being used in the construction of flight test aircraft. Several flight test Arrows will be built to speed this program.



Front center fuselage section moves down the CF-105 production line as nose is being joined to a wing in the background.



Technicians assemble side gulls in a full-flight model of the Arrow. Gulls acquire structural stresses due to airflow.



RATO-controlled RP-21 piloted drone is shown at top poised for flight at Army Electronics Flying Ground Ft. Belvoir, Va. Reconnaissance camera fits into front cockpit (bottom).

Night Aerial Reconnaissance Unit Takes Rapid Series Flash Photos

New York-New, lightweight night aerial photo reconnaissance system has earned place or prototype status by team developed by the U.S. Army Sig Int Corp and Lockheed Convair and Interspace Corp.

Heart of the system is a KA-28, 45 x 45 x 45 in. reconnaissance camera unit. It is equipped with controls to image Motion Compensation (MCC) in mind-blurring cover to taking pictures from low altitude at high overall speeds.

The KA-28 system has been installed in a RP-21 drone made by Lockheed Division, Northrop Aircraft.

To take night photographs, the film transport system of the camera retracts a storage canister which opens after each 14 flash cartridge exposure series or each take off of the fuselage. Electrical ignition of powder ignites the cartridges.

Photoflash cartridge canister was designed by the American Defense Universal Match Corp., St. Louis, Mo.

Long Range Planning and Research at Marquardt



Roy E. Marquardt
President

Although aircraft development is the primary divisional focus at Marquardt, there are three other divisions displaying an significant work: Contracts and Services, Test, and Long Range Planning and Research.

The purpose of these divisions is Long Range Planning and Research. Headed by John Strode, and numbered 100 employees, the division has two primary functions:

PLANNING—anticipating product trends in areas where we now operate or might enter. Actually this planning does not mean prophecy, and normally the results end up as recommendations.

SUPPORT—to the other divisions, by calculating the cost of our products which offer promise for the future. These entrepreneurs generally utilize a small scale process to determine the cost of production and profit factors who may be connected with items which do not fit into present Marquardt projects.

Long Range Planning and Research was born out of one of the first studies concerned with where the company can move to next or where it might fit in on the aerospace frontier. To date, over 100 new growth paths have been plotted. Some are variations of systems now in existence, others are radically different.

Projects also have profiled new "exotic" fuels, new types of diffusers, reentry vehicles, and materials. One such item, Aerogel, has potential uses as yet being explored.

Marquardt was broken from Northall, California recently for a research and development center. It will probably well have testing capabilities by March 31st as a wind tunnel and Mach 10 test flow jet testing with constant temperature and pressure conditions (Hypersonic Wind Tunnel). In addition, it will support investigations of atmospheric conditions to Mach 8 and altitude 100,000 feet.

Within the Division, research engineers will find a spectrum of research engineering opportunities, including:

Electronics **Aero-Transportation**
Materials **Reentry Vehicles**
Chemical

For information about these positions call the personnel engineering department at Marquardt Division or write Jim Dyer, Personnel Manager, Marquardt Division, 24421 Century St., Van Nuys, Calif.

Roy E. Marquardt



JOINT IN PARTNERSHIP

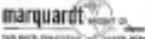
WITH NORTH AMERICAN AVIATION INC.

To Research Engineers Facing an ENGINEER|BARRIER*

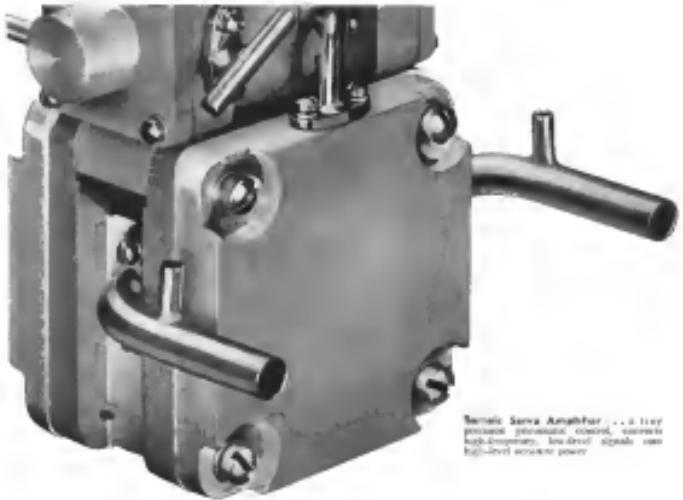


Marquardt Division Hypothetically—Research engineers have a ventilated spectrum of projects at Marquardt Division, the company where an ENGINEER|BARRIER has never existed. But, if you face one, we hope you will work with a management that recognizes and rewards the contributions of engineers. Look to your future by looking to Marquardt. Today. Address your inquiries to Jim Dyer, Personnel Manager, Marquardt Division, 24421 Century St., Van Nuys, Calif.

States: John Strode, Director of Long Range Planning and Research Division



*ENGINEER|BARRIER—an achievement level beyond which you cannot advance.



Termix Servo Amplifier . . . a true precision potentiometer control, converts high-frequency, low-level signals into high-level accurate power.

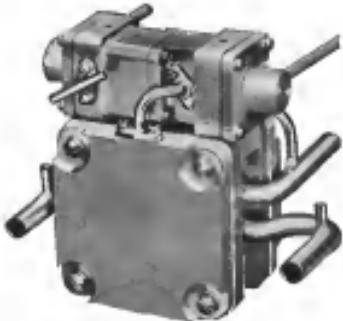
Memo: to missile men looking for dependable components

"Men from small aircraft to guided missiles can be smach when you recognize that today's aircraft and tomorrow's missiles have similar functions and require similar controls. Often, a precise control developed for one has application on the other."

Cause in point: The Termix servo amplifier—the "servo" of the aircraft world that revolutionized the art of flight control. The unique light weight and high accuracy of this unit, completely pre-emptive unit gives the unequalled superior flight characteristics, 3-axis control, half the weight and cost of conventional types.

Built: A precision control with performance characteristics never to be equaled. Having a polarity switch with variable resistance, it converts high frequency, low level signals (into high-level power) produces a true three replica of the control input signal, even under extremely high and low temperatures. It weighs 11 lbs. at 1, requires no current, and is small enough to hold in the palm of a hand.

Supplier: As standard or special components, let us assist you with your new precision valve applications. Every problem has a solution. Write or telephone. It is the opinion that over 16 years Textron Valves Division, Aerotest Products Company, Bridgeport, Pa. 11606.



TACTAIR®

Stock Transactions

Washington— Disposal of 27,000 Conti-Wright Corp. common shares by Roy T. Hader, officer and director, has been made to the Securities and Exchange Commission, leaving a total holding of 15,500, with Hader's wife beneficially holding 100 common shares.

Other Conti-Wright transactions reported yesterday: Disposal of 2,000 common shares by T. Ralphi Berney, director, leaving a holding of 1,300; disposal of 1,000 common shares by Jack O'Charanahan, officer, leaving a holding of 1,000; disposal of 5,000 common shares by Thomas C. Corcoran, officer, leaving a holding of 5,000.

Disposal of 1,000 common shares by Michael Doherty, officer, leaving a holding of 1,000; disposal of 400 common shares by William T. Lyle, officer, leaving a holding of 2,400; disposal of 1,000 common shares by Frank W. Monell, officer, leaving a holding of 1,000; acquisition of 1,000 and disposal of 2,000 common shares by S. H. Karmazin Jr., by a holding of 6,100; acquisition of 1,100 and disposal of 1,000 common shares by Joseph V. Macio, officer, for a total holding of 5,500.

Other stock transactions reported by the SEC:

Aero Space Manufacturing Co., Inc. Acquisition of 500 common shares by Robert P. McNamee, director, for a holding of 1,100; common shares by Harry P. Merrell, director, for a holding of 1,000; acquisition of 1,000 common shares by James J. O'Farrell, director, leaving a total holding of 1,000; acquisition of 1,000 common shares by John P. O'Farrell, director, leaving a total holding of 1,000; and 1,000 common shares by Edward J. O'Farrell, director, leaving a total holding of 1,000.

Acrodyne Corp. Acquisition of 100 common shares by Robert P. McNamee, director, for a holding of 1,000; acquisition of 100 common shares by George A. O'Farrell, director, for a holding of 100.

American Airlines Inc. Acquisition of 100 common shares by J. M. Robinson, director.

Aeroplane Industries Inc. Acquisition of 100 common shares by Walter J. Morris, chairman.

Americair Airlines Inc. Acquisition of 100 common shares by Robert P. McNamee, director.

American Motor Arms Association of America, Inc. Acquisition by J. William Johnson, chairman, of 100 common shares, leaving a holding of 100; and 100 common shares by Robert P. McNamee, director, for a holding of 100.

Airbus Corp. Acquisition of 2,000 common shares by David A. Stevens, officer, for a holding of 2,000; and 100 common shares by Robert P. McNamee, director, for a holding of 1,000.

Amico Manufacturing Corp. Acquisition of 100 common shares by E. G. Wilson Jr., president and director, for a total holding of 1,000.

Avco Aircraft Corp. Acquisition of 100 common shares by Robert P. McNamee, director, for a holding of 1,000; and 100 common shares by Robert P. McNamee, director, for a holding of 1,000.

Californtech Electronics Inc. Disposal of 100 common shares by Robert P. McNamee, director, for a holding of 100.

Commodore Air Miles Inc. Acquisition of 100



F-104A Carries Test Boom

Laden F-104 equipped with a 4 ft. test boom is shown being prepared for test. Aft access is secured through the point at the boom's end and pitch and yaw angles by the T-shaped catches. Note large pyres tied牢系 suspended on wings.

Small Arms Inc. Disposal of 100 common shares by J. William Johnson, director, for a holding of 1,000; and 100 common shares by R. P. McNamee, director, for a holding of 1,000.

Stelco Products Corporation Inc. Acquisition of 100 common shares by R. P. McNamee, director, for a holding of 1,000; and 100 common shares by James W. Wilson, director, for a holding of 100.

Sunbeam Aircraft Laboratories Inc. Acquisition of 100 common shares by Frederick J. St. John, director, for a holding of 100; and 100 common shares by Robert P. McNamee, director, for a holding of 100.

Swissair Air Transport Corp. Acquisition of 100 common shares by Raymond Prud'homme, director, for a holding of 100.

Swissair Air Freight Corp. Acquisition of 100 common shares by Raymond Prud'homme, director, for a holding of 100.

United Dynamics Corp. Disposal of 100 common shares by Robert P. McNamee, director, for a holding of 1,000; and 100 common shares by E. G. Wilson Jr., president and director, for a holding of 1,000.

Varian Associates Inc. Disposal of 100 common shares by A. D. Mandelbaum, director, for a holding of 100.

McDonnell Aircraft Corp. Acquisition of 100 common shares by E. G. Wilson Jr., president and director, for a holding of 100; and 100 common shares by Robert P. McNamee, director, for a holding of 100.

National Airlines Inc. Acquisition of 100 common shares by Richard A. Pfeifer, director, for a holding of 100.

Ortho-Medics Inc. Acquisition of 100



GRANT SLIDES BREAK THE "DELAY" BARRIER!

- by reducing servicing time
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Grant Industrial Slides offer a new concept in the high speed servicing of today's high speed aircraft. They break the "delay" barrier by presenting the data containing circuitry, giving it quick access to all parts of the aircraft without maintenance without costly time in opening the plane.

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EXCELSIOR SYSTEMS DIVISION, Pasadena, Calif. 91103. (213) 944-5120. Telex 24-2100.

TECHNICAL INSTITUTE OF WISCONSIN, Dept. L-1, Milwaukee, Wis. 53201. (414) 483-1515. Telex 24-2100.

WILCOX AND CHAMBERS INC. Philadelphia, Pa. 19103. (215) 563-1200. Telex 24-2100.

AVIATION SUPPLY OFFICE, THE MICHIGAN AVIATION FEDERATION, 1000 Washington Blvd., Suite 1000, Detroit, Mich. 48202. (313) 964-4323. Telex 24-2100.

INDUSTRIAL AND COMMERCIAL PLANNING GROUP, 1000 Washington Blvd., Detroit, Mich. 48202. (313) 964-4323. Telex 24-2100.

INTERSTATE FLUIDS GROUP, OFFICE FOR THE NATIONAL AIR FORCE, New York City. Systems Engineering Corp., Planning Bldg. 1, 300 Madison Avenue, New York, N.Y. 10017. (212) 580-1000.

NATIONAL PURCHASING OFFICE, 1000 Washington Blvd., Detroit, Mich. 48202. (313) 964-4323. Telex 24-2100.

INSTITUTE OF ORGANIC ANALYSTS, Washington, D.C. 20004. Laboratories, West Chicago, Ill. 60185. Systemic analysis, inventories, and evaluation services. (312) 223-1100. Telex 434-450.

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USAF Contracts

Washington—Following is a list of unclassified contracts for \$25,000 and over as released by Air Force Contracting Office:

DOVER AFB, Dover, Del. 1400-Telco

• Photo Strip Sort Crews of America, Inc., 1400-Telco. Contract number AF-1400-Telco-1277.

FAIRCHILD AEROSPACE CO., El Segundo, Calif. Contract number AF-1400-Telco-1278.

Contract number AF-1400-Telco-1279.

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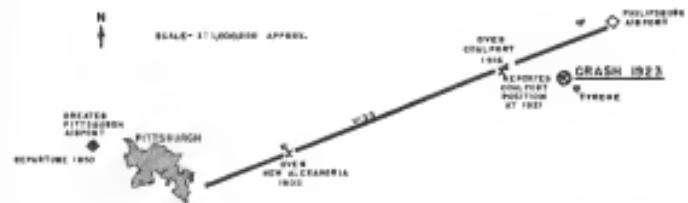


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SAFETY



LONESTAR coded Dec. 18, 1955, when loss of control for reasons unknown caused road descent down which structural failure occurred.

CAB Accident Investigation Reports

Loss of Control Probably Caused Crash

A Lehigh Locomotive model 15-96, N 12475 owned by United States Steel Corp and operated by its subsidiary California Casualty Steel Co, derailed approximately 1 mi north of Tipton, Pa about 1927 on Dec 20, 1956. The captain, co-pilot and a company official, the only persons aboard, were killed and the locomotive was destroyed.

HISTORY OF THE FLIGHT

N 194IV departed Cooper Pittsburgh August, Pittsburgh, Pa. at 1030 Sat 20, 1956 en route to New York Seafair plan via airports V 15, V 6, V 66, V 10 and V 1 to New York International Airport Jamaica N Y. The crew consisted of Capt. Ray H. Bell and Captain Lester Thomas Williams. My John Ranch, president of Columbia-Greene Steel Co., was the sole passenger.

At the time of takeoff from Pittsburgh, the gross weight of the aircraft was 79,421 lb (maximum allowable gross load 79,500 lb) and the weight was properly distributed. The purpose of the flight was to transport Mr. Knudtson to New York International Airport.

The flight reported to Pittsburgh Air Route Traffic Control at 1805 when it was over New Alexandria, Pa., altitude 7,405 ft. A revised landing clearance to New York International Airport was issued to the flight at 1808 by ARTCC to proceed via approach V-15 V-6 V-8 and final 16, and to climb in and maintain 9,000 ft. According to NTSB, TWA reported having 7,000 and 8,000 ft at 1807 and 1808, respectively.

Positive Given

In 1921 the Cord Automobile Company's Motor Communication Station at Flushing, N.Y., received a call from the flight master at Bremen, Germany, the Captain

SAF 150044 0000-00-0000-0000-0000
Based on 2000-00-0000-0000-0000

intersection at 1916, estimating Philippines at 1930. Philippines radio then requested N114IV to change over to the frequency of the New York Air Route Traffic Control Center and that message was acknowledged. This was the last radio contact with the

At 1815 Philadelphia radar received a triplebeam cell from a location 25 mi east of the Concourse intersection and approximately 12 mi south-southwest of the Philadelphia Airport to the effect that an incendiary had descended to N 12°0'W., had exploded and was burning in a nearby mountainous area.

The Philippines 1925 weather information
Date: October 1925
Latitude: 21° 15' N.
Longitude: 120° 45' E.
Altitude: 600 ft.
Temperature: 76° F.
Humidity: 80%
Wind direction: NE
Wind speed: 10 mph
Cloudiness: 50%
Precipitation: 0 mm

INVESTIGATION

The place of ground impact was in heavily wooded rugged terrain at an elevation of about 1,900 ft. The impact heading of the major wreckage was northwesterly nearly in recognition of the destination heading. No major parts of the aircraft had separated at impact and these were found scattered over a distance of about 100 ft.

The major parts which separated in flight were the left outer wing panel, the right outer wing panel, the left and right fore and midfins, the left and right horizontal stabilizers and elevators, the right horizontal stabilizer and elevator, the left horizontal stabilizer and elevator, the left engine nacelle, the left engine cowl, and both propellers. All other major components were found at the wreckage site. The landing gear and wing flaps were found at the opposite end along the flight path.

was the first impingage and to separate, followed by the right horizontal stabilizer. The latter component showed evidence of having been struck on its leading edge during the collision; the most logical striking object was the left aeroshell because weight centrally, which also separated in flight.

Following the left wing and empennage failure, portions of the aircraft's tailwings and parts of the fuselage separated. Thereafter, both powerplant assemblies tore out and the right outer wing panel separated just before ground impact.

Review Session Worksheet

It could not be established if the closing train components were in operation at the time of the accident, as the timing of the deceleration prior to impact is unknown. Impact forces caused deformation and bending of the closure distributor valve assembly; however, it was found to be in good condition externally and therefore is believed to have been capable of operation before impact. Except for the damage sustained during the accident, the wing and canopy fairing leading edge closing latches were

in good condition. The original and pupaline wings were attached to the cut scars and transported to the rearing nests located in a plant at Calverley, N.J. The diastrophus and reared adults both pupillaries were engaged with isolated deviating equipment. The positions of the pupillaries were: Left 45 deg., right 61 deg. All stages were properly pupated. Study of the sites prior markings indicated that the pupillae blade angles at impact were: Left 45 deg., right 61 deg., right proctiger 14 deg. A count of the number of both pupillae disclosed evidence of a failure of one of the natural components of the pupillary while a flight. It was observed that there was a similar absence at depopulation in the

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standard chamber of both oxygen and heat and shield were available in retrieving reentry capsule to escape atmosphere and reentry capsule only. Very short circuit was installed on both carbons.

The aircraft was equipped with a dual set of instruments which included interior altimeter, magnetic compass, bank rate of climb and altitude indicator. External instruments that were a gyro compass, directional gyro, Colibri Integrated Flight System and two automatic direction finders.

Radio Damaged

All radio communications and navigation equipment were apparently destroyed. The aircraft and its contents were recovered by the Colibri International Flight Service. The azimuth ring of the compass indicator was on a heading of approximately 45 deg. The heading marker was set at approximately 45 deg and the setting of the compass was approximately 75 deg. The indicator ring of the compass bearing indicator was set at an approximate reading of 45 deg. A compass setting could not be obtained from the remains of the compass.

Examination of the wreckage disclosed no evidence of damage from an explosion. We believe it indicates that a foreign object struck the aircraft in flight. All parts of the aircraft were accounted for within the wreckage distribution area. The main engine, tailplane, were all the critical load承重 parts of the aircraft and the majority of the particular parts or components. There was no evidence which indicated that a fire or explosion occurred during flight.

An examination of the aircraft by both我和 my friends declined to go further. Changes and anomalies found in the aircraft were the result of the accident. The aircraft had been assembled. The log also indicated that the aircraft had received

an presidential 25 hr., 50 min. and 1.0 hr. in question. The aircraft had flown 92.5 miles to 10,000 ft. on Oct. 1, 1956 and 50 miles since the last fuel injection on the day of the accident.

On the afternoon of Dec. 30, 1956, in aircraft started into the same route of Pennsylvania, westbound, flying from 10,000 ft. to 10,500 ft. The aircraft was powered with four engines of approximately 10,000 lb. 12,000 lb. Flying and occasional light rain was occurring. At the time of the flight's departure the pressure level was about 13,000 ft. at Pittsburgh and increasing to the east to 10,500 ft. in the Detroit area. The aircraft was flying at 10,500 ft. with an N 311V colored light in moderate rain along the ceiling level, with the heading level to be 9,000 ft. en route Pennsylvania, flying downward to about 9,000 ft. in eastern New York. Meteorological conditions were conducive to the formation of carburetor or induction ice.

Several Flights

There were several flights through the Philadelphia area at the approximate time of the accident. They reported no icing or carburetor ice. The flight was flying at 10,500 ft. below the 10,500 ft. level of the lock head. Two of these flights completed a broken circle resulting a few miles west of Philadelphia.

A number of witnesses in the accident and based around the accident area located approximately one-half mile south of the accident site and the flight en route at low altitude and then turn back toward the crash site. Two other persons, several rods northeast of the report site heard the crash took place. All witnesses told of hearing strange engine sounds. Estimated time of impact was 10:45 p.m. and the aircraft was flying at 10,500 ft. to the Philadelphia Civil Air Commission Station at 10:53 and the call was nearly silent.



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FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau



WEATHER AND RADIO

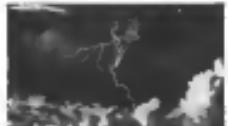
HOW WEATHER CONDITIONS AFFECT THE PROPAGATION OF RADIO WAVES

RADIO RECEIPTION may vary from poor to exceptional depending on the temperature differences. Temperature inversion layer refraction characteristics of the atmosphere. This can result in fresh reception over great distances on VHF channels.

Precipitation static—ice crystals, snow flakes and rain droplets striking aircraft can cause crackling in headphones.

Static due to lightning discharges. These electrical bursts and currents can be picked up at considerable distance. It is often your first indication of thunderstorms activity.

How to minimize static: Change altitude if it can be done safely. Decrease speed at sun or snow impact. When possible, avoid dry snow and rain droplets composed of ice crystals. Keep radio volume turned low to reduce background noise. It is preferable to use a higher frequency broadcast station for ADF homing instead of low frequency range stations. During periods of static, push headphones over ear muffs when not listening—to keep fatigue to minimum.



Aeron Electronics, associated with magnetic sensors. These can measure phenomena such as communication between Tone in Time Signal Broadcasts of Standard Brown of Springfield, O. or 10,000 kilocycles for purposes of perils of your tripnow.

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five minutes after the main wheels rolled taken 1925 in the approximate time of the accident. The action necessary to mitigate the cold wave depicted in Berg's diagram was quite remote and the "bulletin" came in too late to be of much value. The pilot of N-12455 had reported no radio contact with ground or air traffic control enroute to El Centro, and this radio report was given on ordinary tone of voice with no last call or warning emergency.

ANALYSIS

Because of the lack of certain tangible evidence, it is difficult to determine exactly what happened. However, it is apparent that the pilot was flying under IFR conditions and was assigned an altitude of 9,000 ft., also that his last position report was made at 1925. Six minutes after making contact, since this report was made at a minimum of 1,000 ft. above the assigned altitude, it can be reasonably assumed that enroute weather was not considered at that time. However, apparently two minutes after that report was made the aircraft struck the ground. Therefore, what ever happened did in quickly and shortly after the last radio transmission.

Ground elevation at the time of the accident is 1,900 ft. and the altitude assigned and in relation to the mapped altitude of the vicinity would mean the aircraft descended 7,500 ft. at an average rate of descent of about 375 ft./sec. Although the terrain is relatively flat and featureless, it is believed that the speed of the aircraft, during the descent, coupled with increasing loads caused forces beyond the design strength of the aircraft. This is undoubtedly true since no evidence was found to indicate any prior damage or defect of any of the components of the aircraft.

The software unfortunately did not set forth only head the aircraft. Although some stated the direction of flight, the approximate altitude and that the engine appeared to be functioning satisfactorily, it was not known whether the aircraft was flying under conditions in which accurate estimates were not possible. To determine its direction or height above the ground, or both, from the sound would have been originally difficult on this mission because of possible reverberation and distortion among the aircraft and ground. The aircraft may have been caused either by a malfunctioning engine or engine or as the result of the pilot's intentional thumbing back of the engine during an uncontrolled descent.

Engine Examination

The engine which continued in operation until the aircraft impacted the ground was of the Pratt & Whitney R-1830-85, a 14-cylinder air-cooled radial engine, having a maximum power rating of 1,200 horsepower at 2,400 rpm. The engine was in good condition except for the removal of the propeller and the removal of the engine mountings in the course of the emergency. However, it was determined that no major propeller had been destroyed.

Because the strength ring of the case in disaster of the Coffey Integrated Flight System was found stepped at 10 ft. directly the stepped end of the housing at impact and because the instrument is mounted directly, a possible electrical short, or a

corroborating cause to this accident was suggested. It was determined, however, that the probability of such a failure occurring at closing altitude was quite remote and that the failure must have occurred during the landing of the airplane with the stepped end of the housing in contact with the ground.

It is felt that the cause of the accident

was the loss of control of the aircraft. Although the cause of the accident was not determined, it is believed that the cause was the loss of control of the aircraft. Weather observations and forecasts for the area on this day indicated clearly the weather conditions which the flight would encounter. From the use of these observations, it is believed that a point of Capt. Stoll's experience would have allowed him to predict to less of loss of control of the aircraft.

There are possibly many solutions for errors which might have contributed to loss of

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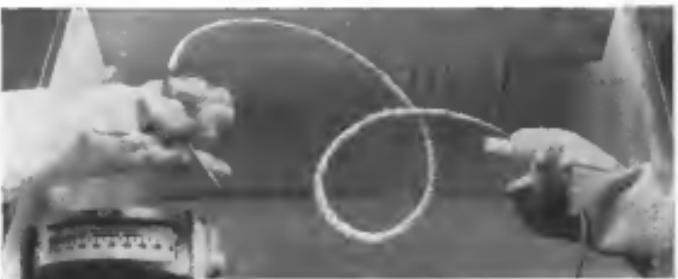
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in control. Undoubtedly, the ignition of such factors as this evidence did nothing to prove our disregard factors of fuel, et cetera. It is the Board's opinion that this had nothing to do with the cause of explosion. However, it is believed that the aircraft was not designed to be destroyed beyond the design strength of the aircraft was due to unknown causes.

FINDINGS

On the basis of all available evidence the Board finds that:

- The crew and aircraft were normally qualified.
- The gross load of the aircraft was under the maximum allowable weight and properly distributed.

A routine instrument flight was made from Atlanta to Philadelphia.

4. Weather and conditions at the weather crossing altitude were conducive to the formation of carburetor or induction icing.

5. During an uncontrolled descent the aircraft failed structurally as a result of loss of control or loss of design strength.

6. There was no attempt or cognizance given to ground impact.

PROBABLE CAUSE

The Board determines that the probable cause of the accident was the loss of control by means unknown resulting in a rapid descent during which structural failure occurred.

By the Civil Aeronautics Board:

James R. Dohler
Chairman
Elmer D. Duray
Loren J. Hartig

(Member G. Joseph Minot did not take part in the adoption of this report.)

SUPPLEMENTAL DATA

The Civil Aeronautics Board was advised of this accident the night of Aug. 20, 1956. An investigation was immediately started in accordance with the provisions of Section 7(a) (1) (G) of the Civil Aeronautics Act of 1938, as amended.

Aircraft Owner

The United States Steel Corp. has legal ownership of "I" Bomber, New York City, and an office at Westchester County Airport, White Plains, N.Y. The defendant, Columbia Gas System Co., had a head office at 125 Montgomery St., San Francisco. The respondent and his subsidiary, equally, manufacture tungsten-type incandescent lamps in the United States. Their incandescent lamps are operated under a standard voltage of 115 volts, 60 cycles, with the power circuitry regular check flights and periodic flight training being included, bearing agency. Manufacture of company aircraft is at its own level.

Flight Personnel

Capt. Roy H. Delta, age 45, held a commercial pilot's license with ratings in airline transport rating in type ratings in Lockheed PV-1 and C-45. He was reported to be an amateur aviator on Jan. 1, 1945, as a pilot, and was transferred to Columbia Gas System Co. on Aug. 21, 1951, as chief pilot. Capt. Roy Delta had flown a total of 10,615 hr., of which 495 had been in the Lockheed

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Lester. His last written flight check was passed satisfactorily on Nov. 3, 1938. The date of his last physical was several days later, Jan. 5, 1939. His flying time, as of the day prior to Dec. 23, 1946, was 21.6 hours.

Pilot Louis Thomas Williams, age 47, held a commercial airplane certificate with ratings of commercial pilot, wings and multiengine land, DC-3 and Lockheed 10, 15, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1245, 1246, 1247, 1248, 1249, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1295, 1296, 1297, 1298, 1299, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1315, 1316, 1317, 1318, 1319, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1325, 1326, 1327, 1328, 1329, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1335, 1336, 1337, 1338, 1339, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1345, 1346, 1347, 1348, 1349, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1355, 1356, 1357, 1358, 1359, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1365, 1366, 1367, 1368, 1369, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1375, 1376, 1377, 1378, 1379, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1385, 1386, 1387, 1388, 1389, 1389, 1390, 1391, 1392, 1393, 1394, 1394, 1395, 1396, 1397, 1398, 1398, 1399, 1399, 1400, 1401, 1402, 1403, 1404, 1404, 1405, 1406, 1407, 1408, 1408, 1409, 1410, 1411, 1412, 1413, 1413, 1414, 1415, 1416, 1417, 1417, 1418, 1419, 1420, 1421, 1421, 1422, 1423, 1424, 1425, 1425, 1426, 1427, 1428, 1429, 1429, 1430, 1431, 1432, 1433, 1433, 1434, 1435, 1436, 1437, 1437, 1438, 1439, 1440, 1441, 1441, 1442, 1443, 1444, 1445, 1445, 1446, 1447, 1448, 1449, 1449, 1450, 1451, 1452, 1453, 1453, 1454, 1455, 1456, 1457, 1457, 1458, 1459, 1460, 1461, 1461, 1462, 1463, 1464, 1465, 1465, 1466, 1467, 1468, 1469, 1469, 1470, 1471, 1472, 1473, 1473, 1474, 1475, 1476, 1477, 1477, 1478, 1479, 1480, 1481, 1481, 1482, 1483, 1484, 1485, 1485, 1486, 1487, 1488, 1489, 1489, 1490, 1491, 1492, 1493, 1493, 1494, 1495, 1496, 1497, 1497, 1498, 1499, 1499, 1500, 1501, 1502, 1503, 1503, 1504, 1505, 1506, 1507, 1507, 1508, 1509, 1509, 1510, 1511, 1512, 1513, 1513, 1514, 1515, 1516, 1517, 1517, 1518, 1519, 1519, 1520, 1521, 1522, 1523, 1523, 1524, 1525, 1526, 1527, 1527, 1528, 1529, 1529, 1530, 1531, 1532, 1533, 1533, 1534, 1535, 1536, 1537, 1537, 1538, 1539, 1539, 1540, 1541, 1542, 1543, 1543, 1544, 1545, 1546, 1547, 1547, 1548, 1549, 1549, 1550, 1551, 1552, 1553, 1553, 1554, 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1677, 1677, 1678, 1679, 1679, 1680, 1681, 1681, 1682, 1683, 1683, 1684, 1685, 1685, 1686, 1687, 1687, 1688, 1689, 1689, 1690, 1691, 1691, 1692, 1693, 1693, 1694, 1695, 1695, 1696, 1697, 1697, 1698, 1699, 1699, 1700, 1701, 1701, 1702, 1703, 1703, 1704, 1705, 1705, 1706, 1707, 1707, 1708, 1709, 1709, 1710, 1711, 1711, 1712, 1713, 1713, 1714, 1715, 1715, 1716, 1717, 1717, 1718, 1719, 1719, 1720, 1721, 1721, 1722, 1723, 1723, 1724, 1725, 1725, 1726, 1727, 1727, 1728, 1729, 1729, 1730, 1731, 1731, 1732, 1733, 1733, 1734, 1735, 1735, 1736, 1737, 1737, 1738, 1739, 1739, 1740, 1741, 1741, 1742, 1743, 1743, 1744, 1745, 1745, 1746, 1747, 1747, 1748, 1749, 1749, 1750, 1751, 1751, 1752, 1753, 1753, 1754, 1755, 1755, 1756, 1757, 1757, 1758, 1759, 1759, 1760, 1761, 1761, 1762, 1763, 1763, 1764, 1765, 1765, 1766, 1767, 1767, 1768, 1769, 1769, 1770, 1771, 1771, 1772, 1773, 1773, 1774, 1775, 1775, 1776, 1777, 1777, 1778, 1779, 1779, 1780, 1781, 1781, 1782, 1783, 1783, 1784, 1785, 1785, 1786, 1787, 1787, 1788, 1789, 1789, 1790, 1791, 1791, 1792, 1793, 1793, 1794, 1795, 1795, 1796, 1797, 1797, 1798, 1799, 1799, 1800, 1801, 1801, 1802, 1803, 1803, 1804, 1805, 1805, 1806, 1807, 1807, 1808, 1809, 1809, 1810, 1811, 1811, 1812, 1813, 1813, 1814, 1815, 1815, 1816, 1817, 1817, 1818, 1819, 1819, 1820, 1821, 1821, 1822, 1823, 1823, 1824, 1825, 1825, 1826, 1827, 1827, 1828, 1829, 1829, 1830, 1831, 1831, 1832, 1833, 1833, 1834, 1835, 1835, 1836, 1837, 1837, 1838, 1839, 1839, 1840, 1841, 1841, 1842, 184

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LETTERS

Reply on Tuning

In the Sept. 9 "Captain Yourself!" (p. 51) Capt. Robert addressed the Avionics Electronic Engineering Committee for developing an Aging AFE Equipment Characteristics based on a "decade" of aging tuning concepts. Since the publication of his article, the Avionics Electronic Engineers have submitted same degree of support for Capt. Robins' views expressed by Capt. Robins; however, as Capt. Robins knows, the tuning algorithms he has suggested to many airline people have been expanded by others.

All of the communication and aerospace block material on this subject was received by the Avionics Electronic Engineering Committee in its Nov. 13 meeting. To many U.S. airlines and 10 foreign airlines, tuning requirements are not a concern from the airlines' viewpoint that the new AFE equipment, which were the subject of Capt. Robins' comments, are now available by many airlines of over the world. In order to be a question discussed in the industry, tuning with such a large number of airlines would be required. The committee has determined that there are no problems with the tuning issue. Accordingly, ARINC and AFE plus changes to the tuning system specified in the MILSPEC AFE characteristics do not affect what the various types of aircraft equipped will not be used as it has always been the practice for certain control panels to be designed for individual use; however, the basic tuning assignment will still probably be used if a pilot or dispatcher type of circumstance off the ARINC characteristic.

Perhaps some pilot will never fully accept the advanced design of AFE which is a result not with considerable thought by ARINC with the full cooperation of the manufacturers, but with the help of the airlines. This would take time, but I believe that the discussions between ARINC and AFE manufacturers equipment presented by the airline members prove more than a decade ago.

The Avionics Electronic Engineering Committee has not been asked to direct effort to provide for new pilot the most advanced electronic equipment which the airlines will permit. Living in a democracy we know of no other way to develop and implement new equipment except by working with the people who design and work out the desired features using our democratic process. If one individual doesn't like the final result he can either say so or leave and try to tell the others or he can stay in his present position and change. I fully agree that the airlines need better facilities if they fit in the line of best effort, but other forms of transportation—airports the railroads—will handle just fine. The airlines are better suited and dedicated agencies to handle passenger traffic, which apparently are bound to move less time to time? I have said of late that planes cost us over 200 people. With air traffic control and other positions still more can be cut. I am not suggesting that we should not hire engineers, technicians, etc., but rather suggest increasing 200-400 percent are possible, perhaps even more, during the next few years.

Today the AFE is highly regarded in developing equipment characteristics as we receive new systems. The Doppler radar system of AFE's major project has met us by being held up again to have the

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under requirements, the manufacturer's capabilities, the consumer benefit of initial cost and maintenance, and the approach to design. (Previously shown in the spring of 1968) an ARINC Equipment Characteristics will be finalized, providing the best cost/benefit ratio for these various factors. It could very well be the case also the ARINC characteristics be a backlog of user selected equipment selected by the airlines. As Capt. Robins says, "We'll know that hindsight is better than foresight and the new can still find something to come in 1981 with our 1972 designs but we would rather have the help and assistance from Capt. Robins and all the other airline pilots." Watch this column in 1985. Our ARINC AFEIC meetings are open to anyone who has interest. A letter to ARINC is all that is needed to be included on an appropriate project mailing list.

JOHN T. COOPER Jr.
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Airlines Electronic Engineering
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Manager Electronic Engineering
Aerospace Division, Inc.
Wilmington, Del. 19803

Jet Age Plans

I have been with the airlines and do lots of planning for many years, and I feel that much of the planning for the jet age is very straightforward—the airplane "not for" the long term.

Planning for the future lies in other forms of transportation, how can they benefit the amount of extra revenue, forecast and some business lies above have had to be reorganized. This is not an area that the airlines should be involved except in the short term or low intensity of use, such as every 20 years or so, but not 100% in one fleet swap.

When people have been concerned for many years about proving ground rules, stamping out proved aircraft changes, I fully agree that the airlines need better facilities if they fit in the line of best effort, but other forms of transportation—airports the railroads—will handle just fine. The airlines are better suited and dedicated agencies to handle passenger traffic, which apparently are bound to move less time to time? I have said of late that planes cost us over 200 people. With air traffic control and other positions still more can be cut. I am not suggesting that we should not hire engineers, technicians, etc., but rather suggest increasing 200-400 percent are possible, perhaps even more, during the next few years.

It is not too important in proportions necessarily, in all off people size by one

or even 75 percent as in a DC-10 crash. But a cost of two pilot places and a load limit of perhaps 100 people is another matter entirely. With the advantages and at least one automated magazine placing up until相當于上文的"it is world wide"，the advantages to level down. No one knows how many passengers there are in a single airplane, comes to the 80, but I assume just the number is very influential.

It is not a problem, but I have talked with a good man, people inside the airline industry, and the airlines, over a long period of time. They are not alone about a pilot being an auto

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Civil Service

Aviation is rapidly moving to the 1980s cockpit but because Avionics Works is an instrumentation supplier and not aircraft manufacturers, it is finding that the aircraft market is 10 years behind the latest page of the Dec. 1979 issue of *Aerospace magazine*. So we have been working on both sides of the fence. At last year's air shows, one that which featured commercial Civil Aviation products are finally expressed in the aircraft have not had any problems with the manufacturers. See the proportion of subcontractors in my own portion and 100% in the aerospace portion.

Rather than taking the space for myself and discussions of the customers cited, I would like to let you know what I believe is the best future. The effectiveness and efficiency of any organization depends on the caliber of its personnel and on their enthusiasm. Thus the primary responsibility of management, both in its selection and its development, is to recruit, train, motivating and nurturing their activities so as to produce the best results with the least expenditure. This can be done by the fact to see that management does not have serious problems about the personnel, and the personnel does not have serious problems about the management. One that I think handles the personnel problem is the signal in the lack of a definite status at measuring for operations which however is in the human chart. But I doubt that any substantial spokesman can get up and say exactly that one can have not low morale problems in some degree. Generally, many of the letdowns from engineers in the unmeasured 17 districts which have appeared on your pages, could be easily resolved.

In short, almost everybody has plenty to do in the field of management. And the number of people working for the government on a dedicated and severe schedule who would not only be accepted by industry, but also one might feel is in distress, is much higher than with comes to the field. That is the reason why I am not against the use of the aircraft in conventional gyros. The low drift in the vertical axis gyro seems to me to be the best choice for the aircraft, especially in the case of the aircraft operating in a 10° pitch range. The low drift in the horizontal axis gyro seems to me to be the best choice for the aircraft, especially in the case of the aircraft operating in a 10° pitch range.

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AERONAUTICAL EQUIPMENT DIVISION
SPERRY AVIONICS COMPANY
Schenectady, New York 12301
(518) 356-2000 (518) 356-2000

Announcing...

*complete
coverage of
NAS drawings*
with ESNA's new series of

**lightweight
all-metal counterbored miniature self-locking nuts**



Have you analyzed the structural design advantages and weight-saving possibilities offered by ESNA's AN approved versions of the new NAS low-height, lightweight, counterbored types of self-locking nuts?

For example, there is ESNA's LHTM-TE and LHTA51 series for structural applications which conform to NAS 679-695 drawings for low-height counterbored locknuts. These parts meet the tensile, vibration, twist and push-out requirements of MIL-N-25027 (ASC), performing satisfactorily at temperatures up to 550° F; they also meet AN-N-5 and AN-N-10 tensile specifications and are dimensionally interchangeable with AN363, 364, 365, 366 parts. These nuts combine high strength with lightweight and reduced height; the counterbored base eliminates use of shims to keep threads out of bearing. Extra weight savings can be obtained by using them with new 160,000 psi short thread length NAS bolts.

Now, to meet the increasingly severe space limitations of new missile and avionic designs, ESNA announces the availability of a full line of NAS miniature, counterbored self-locking nuts conforming to NAS 696, 697, 698 drawings. All of these new Elastic Stop nuts use ESNA's AN approved offset crown locking device which exerts locking torque radially and elastically to assure vibration-proof tightness and extended re-usability.

For significant new developments resulting from space- and weight-saving fastener research look to ESNA, pioneer producer of the famous red collar Elastic Stop nuts.



**ELASTIC STOP NUT CORPORATION
OF AMERICA**

MAIL COUPON FOR DESIGN INFORMATION

Dept. N42-125, Elastic Stop Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastener information:

Spec sheets on new
LHTA51 Series

Here is a drawing of our product.
What type of self-locking fastener
would you suggest?

Spec sheets on new
LHTA51M Series

Name _____ Title _____

Company _____

Street _____

City _____ Zone _____ State _____